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The distribution of the Bulletin in signatures has been discontinued.

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BULLETIN

OF THE

AMERICAN MUSEUM OF NATURAL HISTORY.

VOLUME XII, 1899.

Article I.—ON MAMMALS FROM THE NORTHWEST TERRITORY COLLECTED BY MR. A. J. STONE.

By J. A. ALLEN.

The collection of mammals forming the basis of the present paper is one of unusual interest; although the number of specimens and species represented is small, several of the species are new to science, and all are new to the Museum collection. They were collected in the Deese Lake region and on the extreme headwaters of the Liard River, by Mr. A. J. Stone, of the 'Recreation' Northland Expedition.

Mr. Stone set out on his expedition in June, 1897, with the intention of spending three years or more in exploring the lesser known parts of the Northwest Territory and Alaska. The present collection, made in 1897, is the first installment that has reached the Museum, but other important collections are either on the way or await opportunity for shipment.

The expedition was primarily organized under the auspices of the magazine 'Recreation,' but later Mr. James M. Constable, one of the Trustees and the First Vice-President of this Museum, has contributed, in the interest of this Institution, very liberally in aid of Mr. Stone's work, in return for which Mr. Stone is to collect specimens of the larger mammals of the regions visited, and incidentally as many of the smaller species as circumstances will permit. The results of Mr. Stone's expedition will thus doubtless prove of great importance to this Museum.

The measurements (in millimetres) given are those made by the collector from fresh specimens, unless otherwise stated.

1. **Ovis stonei** *Allen.* STONE'S MOUNTAIN SHEEP; BLACK SHEEP.—Mr. Stone has sent three additional examples of this fine Sheep (see this Bulletin, Vol. IX, 1897, pp. 111–114), an adult female, a yearling male, and a kid, two of which have been mounted, making a series of five now on exhibition, showing both sexes and young of different ages.

In his report of progress, dated June 30, 1898, he gives the following important information respecting the range of this animal. He writes: "I traced the range of *Ovis stonei* or Black Sheep throughout all the mountainous country of the headwaters of the Stickeen and south to the headwaters of the Nass, but could obtain no reliable information of their occurrence further south in this longitude. They are found throughout the Cassiar Mountains, which extend north to 61° north latitude and west to 134° west longitude; how much further west they may be found I have been unable to determine; nor could I ascertain whether their range extends from the Cassiar Mountains into the Rocky Mountains to the north of Francis and Liard Rivers. But the best information obtained led me to believe that it does not. They are found in the Rocky Mountains to the south as far as the headwaters of the Nelson and Peace Rivers, in latitude 56°. But I proved conclusively that in the main range of the Rocky Mountains very few of them are found north of the Liard River. Where this river sweeps south through the Rocky Mountains to Hells Gate, a few of these animals are found as far north as Beaver River, a tributary of the Liard. None, however, are found north of this, and I am thoroughly convinced that this is the only place where these animals may be found north of the Liard River.

"I find that in the Cassiar Mountains and in the Rocky Mountains they everywhere range well above timber line, as they do in the mountains of the Stickeen, the Cheonnees, and Etsezas.

"Directly to the north of the Beaver River, and north of the Liard River below the confluence of the Beaver, we first meet with *Ovis dalli.*"

2. Ovis dalli (*Nelson*). NELSON'S MOUNTAIN SHEEP; WHITE SHEEP.—Two specimens of this species have been received, taken by Mr. Stone in the Nahanna Mountains, a spur of the Rockies on the eastern slope, about 61° N. They were killed the latter part of May, 1898, with the old coat about half shed. The two coats thus represented being both white, shows that the species is always white.

As stated above, Mr. Stone first met with this species just north of the Beaver River, and north of the Liard River below its confluence with the Beaver. He adds: "This is their southernmost range, whence it extends north almost to the Arctic coast. I made very careful inquiry of the Indians of the Ettshotas, Takullas, and Spatotimas tribes, who hunt this region, and they were unanimous in their declaration that the Black and White Sheep never mingle together; that the Black are never found north of the Beaver River and that the White Sheep are never found south of it. This information was substantiated by the testimony of the Histolenas or Mountain Indians and that of the Schotinas of the Liard River."

I subjoin the measurements of six additional adult specimens collected in July and August, 1898, by Mr. Stone, but not yet forwarded. They were taken in the Rocky Mountains, in latitude 65° 45′, near where the Carcass River leaves them.

MEASUREMENTS OF OVIS DALLI.

	♂ ad.		♂ ad.		♂ ad.		♀ ad.		♀ ad.		♀ ad.	
	Inches.	Mm.	Inches.	Mm.	Inches.	Mm.	Inches.	Mm.	Inches.	Mm.	Inches.	Mm.
Length.....	58.5	1476	57.5	1360	56	1422	53.75	1355	51	1295	54	1372
Tail.....	4	102	4	102	4	102	3.5	89	3	76	3.5	89
Tarsus.....	16.5	419	16	406	15.5	394	14.75	365	15.5	394	15	381
Femur to humerus..	36	914	33.5	751	32	813	32	813	27.5	698	33	838
Width of chest.....	10.5	267	10	254	10	254	8	203	7.75	197	9.25	235
Height at shoulder.	39	991	34.5	866	36.5	928	33.5	851	34.75	783	33.5	851
" " elbow....	22	539	22	539	21.5	527	20.75	526	20	508	20.5	521
Depth of body.....	18	457	16.5	419	17.5	443	15	381	14.75	375	15.5	394

3. Zapus saltator, sp. nov.

ARCTIC JUMPING MOUSE.

About the size of *Z. hudsonius*, with much heavier dentition. Pelage very long and thick. Above about equally varied with chrome yellow and black

over the whole dorsal area; sides chrome yellow heavily lined with black; below pure white, the white of the lower parts separated from the color of the dorsal surface by a pale yellow prominent lateral line; feet soiled whitish; tail bicolor, blackish above, gray below, nearly naked to near the tip, with a well developed apical tuft. Ears small, colored like the back, narrowly edged with yellowish.

Total length (of type and only specimen), 216; tail, 140; hind foot, 32; ear (from crown, measured from dry skin), 8.

The skull is too imperfect for satisfactory measurement. Compared with average examples of *Z. hudsonius* it is noticeably larger, with much heavier dentition.

Type, No. 14,408, ♀ ad., Telegraph Creek, N. W. T., Aug. 23, 1897. Collected by A. J. Stone.

This species differs markedly from even late fall specimens of *Z. hudsonius* in its very thick, long pelage, somewhat larger size, much heavier dentition, and the peculiar, pale tint of the yellow of the upper parts, in this respect resembling *Z. princeps*.

4. Lemmus helvolus (*Richardson*). RICHARDSON'S LEMMING.—Represented by a single specimen, taken in the Cassiar Mountains, Sept. 16, 1897.

5. Phenacomys constablei, sp. nov.

CONSTABLE'S VOLE.

Above brown with a slight tinge of pale chestnut, varied with black-tipped hairs, brighter and more yellowish chestnut on the face and top of the head as far back as the ears; sides lighter; under parts grayish white with plumbeous underfur; feet brownish white; tail bicolor, blackish above, gray below; inner surface and edges of ears with a faint reddish tinge; a whitish tuft at posterior base of the ears.

A young adult is grayish brown, lacking in great degree the pale chestnut suffusion of the adult. The tail is also darker, being quite blackish above.

Total length (of type), 124; tail vertebræ, 32; hind foot, 19.

Type, 14,406, ♀ ad., Telegraph Creek, N. W. T., Aug. 25, 1898. Collected by A. J. Stone.

Named for James M. Constable, Esq., First Vice-President of the American Museum of Natural History, to whose liberality the Museum is indebted for the valuable collections gathered by Mr. Stone in the Northwest Territory.

In dentition and coloration *Phenacomys constablei* is allied to the *P. ungava* group, but in size it agrees with *P. preblei* The type is a breeding female.

6. Evotomys alascensis *Miller.* ALASKAN RED-BACKED VOLE.—Three specimens, from Liard River, Dec. 7–11, 1897. Measurements: Total length, 110 (108–111), tail vertebræ, 24 (21–27); hind foot, 16.6 (14.7–17.5).

7. Evotomys dawsoni *Merriam.* DAWSON'S RED-BACKED VOLE.—Six specimens, from the following localities: Cheonnee Mountains, July 31; Telegraph Creek, Aug. 25 and 26; Cassiar Mountains, Sept. 16. Measurements: Total length, 122 (116–127); tail vertebræ, 27 (24–31); hind foot, 18.5 (16–19.5).

E. alascensis is not only smaller than *E. dawsoni*, but the color is quite different, in the latter the sides and lower parts being much more fulvous, and the dorsal band light yellowish chestnut instead of very dark deep chestnut, more varied with black-tipped hairs. There are also well marked cranial differences, as in the form of the posterior border of the nasals, which in *E. dawsoni* are evenly rounded, and in *E. alascensis* end in a pointed extension. The audital bullæ are also smaller and more spherical in *E. dawsoni*, the dentition is weaker, and the whole skull less massive.

8. Microtus stonei, sp. nov.

STONE'S VOLE.

Size small, tail short, m^2 with five closed triangles, as in *M. pennsylvanicus*.

Above dark brown, slightly suffused with very pale fulvous, the median dorsal area, from between the eyes posteriorly, blackish brown, due to the great prevalence of black-tipped hairs; sides paler and grayer; below clear whitish gray with plumbeous underfur, which more or less tinges the surface, especially over the pectoral region. No yellowish eye-ring; ears small, scantily haired externally, clothed within and on the edge with hairs colored like the adjoining surface; no grayish or rufous patch behind the ear; feet grayish brown; tail nearly naked, the scales distinctly visible, penicillate at the tip, blackish brown above, grayish beneath.

Total length, 143; tail, 35; hind foot, 19; ear from crown (in dry skin), 8.5.

Skull narrow, slender; general form and dentition much as in *M. pennsylvanicus*, but nearly one-half smaller in general bulk. Length, from front edge of nasals to occipito-interparietal suture (occipital and basioccipital regions lacking), 23; zygomatic breadth, 13.6; width of brain-case, 12; interorbital breadth, 3; length of nasals, 7; incisors to postpalatal notch, 7. The interorbital region has a strongly developed median longitudinal furrow.

Type (and only specimen), No. 14,404, ♀ ad., Liard River, N. W. T., May 17, 1898. Collected by A. J. Stone, for whom the species is named.

This species appears to bear a close resemblance to *M. fontigenus* Bangs, from Lake Edward, Quebec, in its small size, nearly naked tail, and dark coloration, but it appears to be still smaller, with a shorter tail and smaller hind foot, and the under parts are not "olive gray" but clear whitish gray. The skull shows the type of *M. stonei* to be an old adult.

M. stonei seems also to resemble the *Arvicola noveboracensis* of Richardson (Fauna Bor.–Am., I, 1829, p. 126), renamed *Arvicola drummondi* by Audubon and Bachman (Quad. N. Am., III, 1854, p. 166). There are, however, unreconcilable differences in the coloration as given by Richardson, and still greater as redescribed by Audubon and Bachman. Although their figure and description were based on one of the specimens "obtained by Drummond," it is not at all certain that it was the specimen described by Richardson. Mr. Rhoads has attempted (Proc. Acad. Nat. Sci. Phila., 1894, p. 287) to reinstate the *Arvicola drummondi* of Audubon and Bachman (=*A. noveboracensis* Richardson, not of Rafinesque), taking his "topotype" from Lac La Hache, British Columbia, although, as Mr. Rhoads says, the real type of *A. drummondi* must have come from "a locality far north of that from which my [his] specimen came, also a less aquatic environment, and a somewhat different faunal region." In view of the very unsatisfactory and discordant descriptions given, respectively, by Richardson and by Audubon and Bachman, and the absence of any type locality more definite than "on the Rocky Mountains" (Richardson), or "valleys of the Rocky Mountains" (Aud. & Bach.), it seems better to let the name lapse as unidentifiable than to revive it for a form from a very different region, and very probably unlike the form to which the name *A. drummondi* was originally given. In view of this Mr. Rhoads's provisional name *microcephalus* ("*Arvicola* (*Mynomes*) *microcephalus*," *l. c.*, p. 286) for the Lac La Hache form may well be recognized for that species, which will stand as *Microtus microcephalus* (Rhoads).

Microtus microcephalus, *M. fontigenus*, and *M. stonei* apparently form a rather closely related group, the two latter being possibly merely subspecies of *M. microcephalus*.

10. Microtus vellerosus, sp. nov.

Pelage very soft, long and thick. Above gray, varied over the median area with black-tipped hairs, and with a slight suffusion of pale yellowish brown; sides gray, gradually passing into the color of the back; ventral surface strongly whitish gray; tail bicolor, heavily clothed, dark brown above, grayish white below; feet grayish; ears light brown, nearly naked on both surfaces; no eye-ring, nor any touches of rufous on the cheeks or about the ears or nose.

Length, 173; tail vertebræ, 59; hind foot, 19; ear from crown (in skin), 8.

Skull, total length, 26.5; zygomatic breadth, 15; mastoid breadth, 12; interorbital breadth, 3.5; length of nasals, 8.5. General form of skull much as in *M. pennsylvanicus*, but middle upper molar with only four angles.

Type, 14,403, ♀ ad., Liard River, N. W. T., Nov. 29, 1898. Collected by A. J. Stone.

11. Microtus cautus, sp. nov.

Similar to *M. vellerosus* but less pale and not so gray, with more brownish suffusion above, tail more sharply bicolor (clear white below), and size rather less, with well marked cranial differences.

Length, 165; tail, 54; hind foot, 20.5; ear from crown (in skin), 6.

Skull, total length, 25.5; zygomatic breadth, 15; mastoid breadth, 11.7; interorbital breadth, 3.2; length of nasals, 6.7. Skull similar in general form to that of *M. vellerosus*, but brain case flatter and less deep; basioccipital and postpalatal region broader; postpalatal border with a median notch instead of being evenly U-shaped; the front loop or trefoil of the first lower molar is fluted on the antero-inner border so as to form an incipient angle, making six inner angles, instead of five, as in *M. vellerosus*, and in most other forms of the genus. The teeth are also much weaker throughout the dentition.

Type, No 14,405, ♀ ad., Hells Gate, Liard River, N. W. T. Collected by A. J. Stone.

It is impossible to correlate either of the three species of *Microtus* here described with any of the five species recognized by Richardson in the 'Fauna Boreali-Americana,' owing to his wholly insufficient descriptions and the indefiniteness of his localities. Fortunately he ventured to name as new only one of his species, namely, his *Arvicola borealis*, which is certainly not one of these here described. One or more of them may be covered by his "*A. riparius* Ord?," or his "*A. pennsylvanicus* Ord." His *A. noveboracensis* (ex Raf.) is clearly different, though unidentifiable (see above, p. 6).

12. Peromyscus texanus arcticus (*Mearns*).

ARCTIC WHITE-FOOTED MOUSE.

Hesperomys leucopus arcticus MEARNS, Bull. Am. Mus. Nat. Hist. II, No. 4, 1890, 285.

? *Hesperomys maniculatus* WAGNER, Wiegm. Arch. 1845, i, 148 (Labrador).

? *Peromyscus maniculatus* BANGS, Am. Nat. XXXII, July, 1898, 496 (Labrador).

The Arctic White-footed Mouse is represented by 23 specimens, all but three of which are fully adult and remarkably uniform in coloration. They were collected as follows: Hells Gate, Liard River, April 23–May 4, 1897—8 specimens; Fort Liard, May 17—2 specimens; Liard River, June 3—2 specimens; Cheeonnee Mountains, July 31—3 specimens; Telegraph Creek, Aug. 19–25—9 specimens.

The 20 adults measure as follows: Total length, 160 (149–174); tail vertebræ, 73.5 (65–87); hind foot, 20.3 (19–20.5). The prevailing color above is blackish, suffused with pale fulvous, black predominating over the median area, the sides lighter and more distinctly fulvous.

These specimens are somewhat larger and much blacker than the form heretofore referred by me to *arcticus* from Montana, North Dakota, and the Saskatchewan region, which should be separated as a strongly marked form intermediate between true *arcticus* and *nebrascensis*.

13. Neotoma drummondi (*Richardson*). Drummond's Wood Rat.—Three specimens, Telegraph Creek, Aug. 20 and 30, 1897.

14. Mus musculus *Linn.* House Mouse.—Four specimens from Telegraph Creek show that this ubiquitous exotic has made its way far to the northward in the interior, through man's unintentional assistance. Richardson states that he "saw a dead mouse [of this species] in a storehouse at York Factory filled with packages from England," and adds that the species may have been introduced into all the ports on the shore of Hudson Bay, but that he "had never heard of its being taken in the fur countries at a distance from the sea-coast." During the seventy years that have since elapsed it has certainly become widely dispersed in the interior.

15. Tamias quadrivittatus borealis (*Allen*). Northern Chipmunk.—Four specimens, all males, from Telegraph Creek, taken August 10–26, 1897. Measurements: Total length, 194 (184–203); tail vertebræ, 82 (79–86); hind foot, 30.

16. Sciurus hudsonicus (*Pallas*).—Represented by 6 specimens, all males, taken on Liard River, Dec. 5 and 11, 1897. There is no trace of a black lateral line in any of them. The

collector's measurements, from the fresh specimens, are as follows : Total length (from nose to end of the tail vertebræ), 317 (302–329) ; tail vertebræ, 119 (114–124) ; hind foot, 47 (45–51).

17. Sorex sphagnicola *Coues.*—A small Shrew collected on Liard River, Nov. 29, 1897, is provisionally referred to this species, with which it very well agrees, except in its very small size. Total length, 90 ; tail vertebræ, 36.6 ; hind foot, 12.7. It is, however, adult, but not old.

Note on the Gray Phase of **Evotomys gapperi** (*Vigors*). —A single specimen of the gray phase of *Evotomys gapperi* has been received from Red River, Alberta, Canada, taken Oct. 10, 1898. In color it closely resembles specimens of the gray phase of this animal from Trousers Lake, New Brunswick (= *Evotomys fuscodorsalis* Allen). In size, cranial characters, and dentition it is indistinguishable from ordinary *E. gapperi.* As Mr. Bailey reports (Proc. Biol. Soc. Wash., XI, 1897, p. 124) 46 specimens of this species from various localities in Alberta, all representing the red phase, it is of interest to record the gray phase from the same general region, the gray phase having been previously known from only two points—New Brunswick and the north shore of Lake Superior—widely separated from each other and from the present locality. I am indebted to Mr. G. F. Dippie of Toronto for opportunity of examining and recording the present specimen.

Since the above was written, Mr. Vernon Bailey, in reply to my inquiry as to whether other specimens were known to occur than those he had already recorded, kindly replied as follows : "Last winter while working over the old lot of *Microtus* in the U. S. National Museum, I came across a typical '*fuscodorsalis*,' with blackish back and grayish sides, from Fort Churchill, H. B. T. . . . This fills in the gap and seems to indicate that the form runs clear across the northern edge of the range of *gapperi* " (V. Bailey, in letter, Feb. 2, 1899).

Article II.—DESCRIPTIONS OF FIVE NEW AMERICAN RODENTS.

By J. A. Allen.

Lepus americanus phæonotus, subsp. nov.

Summer Pelage.—General color above pale yellowish gray varied strongly with black; top of head more strongly suffused with fulvous; an indistinct blackish median dorsal line; ventral surface white, with a yellowish brown pectoral band.

Winter Pelage.—Similar to that of *L. americanus*, except that the zone of fulvous underfur is paler and less extended, and the white tipping of the hairs is much longer.

Length, 488; tail vertebræ, 56; ear from crown, 88; hind foot, 139. (This is the largest specimen of the series, and the only one having the collector's measurements.)

Type, $\frac{4491}{35505}$, ♂ ad., Hallock, Kittson Co., Minn., Nov. 19, 1891. Collected and presented by Dr. Edgar A. Mearns.

L. americanus phæonotus differs from *L. americanus*, from Northern New Brunswick, in being somewhat smaller, and in the grayish general effect of the summer pelage, in contrast with the strong yellowish brown of *L. americanus*. In general it shows a decided deviation, in both size and coloration, towards the *Lepus bairdi* group.

This Hare is represented by 4 specimens (in changing pelage) from Kittson Co., Minnesota, collected Nov. 19–22, 1891, by Dr. E. A. Mearns; by a young specimen from Mora, Kennebec Co., Minnesota, collected June 15, 1889, by Dr. Mearns; and by 4 in winter pelage from Moore's Lake, Todd Co., Minnesota, collected in December, 1874, and January, 1875, by J. H. Batty. The Todd County specimens, from near the southern boundary of the range of this form, have the underfur less pale and the overlying white less developed than in the Kittson County examples.

Lepus bishopi, sp. nov.

Size small; ears very small; hind foot, 115, as against 130 in *L. a. phæonotus* and *L. americanus*.

Summer Pelage (somewhat worn).—Above grayish brown tinged faintly with

pale yellowish, with a well defined, rather conspicuous median longitudinal blackish stripe; sides pale buffy gray; below white, with a broad pale yellowish brown pectoral band; inner sides of hind limbs whitish; of fore limbs whitish on proximal half; outer surface of fore limbs strong yellowish brown, of hind feet yellowish brown apically, yellowish brown mixed with white proximally, with the edge of thighs fulvous; head yellowish brown, brighter than the general dorsal surface; ears externally like the head for the basal half, passing into black apically, with a narrow fringe of white on outer border.

Length (approximate from skin), 350; tail vertebræ, 45; hind foot, 115; ear from crown, 55. Skull, total length, 75; zygomatic breadth, 35; mastoid breadth, 29; interorbital breadth, 18; width of postorbital constriction, 13; length of nasals, 28.

Type, No. $\frac{10796}{9094}$, ♂ ad., Mill Lake, Turtle Mountains, North Dakota, July 12, 1895. Collected and presented by Dr. L. B. Bishop, after whom the species is named.

Unfortunately *L. bishopi* is represented by only a single specimen, which differs so much from any form of the *L. americanus* group as to need no comparison with any of them, though most resembling *L. a. phæonotus*. In general features it more strongly recalls the *L. bairdi* group, but is darker even than the Colorado phase of *L. bairdi*, the only form of the group of which I have summer specimens. It is especially characterized by its remarkably small, narrow ears, which are smaller than in *L. mearnsi* of the Cotton-tail group.

Lepus floridanus chapmani, nom. nov.

Lepus sylvaticus bachmani ALLEN, Bull. Am. Mus. Nat. Hist. VI, 1894, 170; *ibid.* VIII, 1896, 56. Not *Lepus bachmani* Waterhouse, 1838 = *L. trowbridgei* Baird, 1855.

In 1894 (*l. c.*) I adopted, following Baird, the name *Lepus bachmani* Waterhouse for the Texas Cotton-tail, considering that the type locality was probably Texas rather than California, as doubtfully given in the original description (P. Z. S., 1838, p. 104). Mr. Oldfield Thomas has recently (Ann. and Mag. Nat. Hist. (7), II, Oct., 1898, p. 320) announced that "on an examination of the type [of *L. bachmani*] now in the British Museum, I find that it is certainly a California hare . . . for, without any room for doubt, it proves to be the species commonly known as *L. trowbridgei*, Baird." A reëxamination of Waterhouse's description shows, rather through omission of prominent features

of coloration of the Texas Cotton-tail than by the characters given, that it really better fits *L. trowbridgei* than the Texas species, especially now that we can allow full weight to the small size given by Waterhouse for *L. bachmani.*

In renaming this strongly marked form it gives me pleasure to connect with it the name of my valued colleague, Mr. Frank M. Chapman, whose Corpus Christi collection, made in 1891, contained the first specimens of this form received at this Museum. I also take as the type of *L. chapmani* specimen No. $\frac{3909}{2983}$, ♂ ad., taken by Mr. Chapman at Corpus Christi, Texas, April 10, 1891.

Mr. Thomas having also shown (*l. c.*, p. 319) that the *Lepus sylvaticus* Bachman, 1837, is preoccupied by a *Lepus borealis sylvaticus* Nilsson, 1832, a new name for the group becomes necessary, and Mr. Thomas has suggested for it *Lepus nuttalli* Bachman, 1837, the type locality of which is "the Plains of the Columbia." As it is evident that true *nuttalli* is not a member of the '*sylvaticus*' group, as now understood, I adopt for the group, in place of *sylvaticus*, the name *floridanus* (*Lepus sylvaticus floridanus* Allen), the next in date, given in 1890 to the form from Southern Florida. The eastern Cotton-tails will therefore stand apparently as below, with the type localities as there indicated.

1. *Lepus floridanus* (Allen), 1890. Sebastian River, Brevard Co., Florida.

2. *Lepus floridanus mearnsi* (Allen), 1894. Fort Snelling, Minnesota.

3. *Lepus floridanus transitionalis* (Bangs), 1895. Liberty Hill, Conn.

4. *Lepus floridanus alacer* (Bangs), 1896. Stilwell, Indian Territory.

5. *Lepus floridanus mallurus* (Thomas), 1898. Raleigh, North Carolina. (= *Lepus sylvaticus* Bachman, 1837, preoccupied by *Lepus borealis sylvaticus* Nilsson, 1832. *Cf.* Ann. and Mag. Nat. Hist. (7), X, Oct., 1898, p. 320.)

Thomomys fulvus alticolus, subsp. nov.

Similar in size and cranial characters to *Thomomys fulvus anitæ*, but much darker and less fulvous in coloration. Above yellowish brown much varied with black, darkest along the median line. The usual dusky spot at posterior

base of ear; nose and edges of cheek pouches blackish. Below strongly washed with reddish fulvous, the hairs plumbeous for the greater part of their length; inside of cheek pouches and anal region white. Tail and upper surface of feet whitish or grayish white, the tail thinly haired.

Total length (collector's measurements) of type, 225 mm.; tail, 61; hind foot, 30. Three specimens (2 ♂ ♂, 1 ♀) measure: Total length, 216 (207–225); tail, 62 (61–63); hind foot, 30 (28–31).

Type, No. 415, collection of W. W. Price, ♂ ad. Collected by D. Coolidge, in Sierra Laguna (altitude 7000 feet), Lower California, July 10, 1896. (Type in British Museum.[1])

For the opportunity of examining these specimens I am indebted to the kindness of Mr. Oldfield Thomas, who, in sending them with other Lower California and Mexican material for determination, thus comments on their relationship to *T. fulvus anitæ*: "Presuming that all the Lower California *Thomomys* were the same I had not sorted them by localities, but on doing so for registration it comes out at once that the Sierra Laguna specimens are strikingly darker in color than the Santa Anita and San José del Cabo ones, so much darker that they must evidently be looked upon as distinct. The Sierra Laguna specimens come from an altitude of 7000 feet, the Santa Anita and San José ones from near the sea level." He adds: "I send 3 specimens, the brightest and lightest of 12. . . . No. 415 [here taken as the type] is about the average color, though several are darker, and one quite blackish. The Santa Anita specimens are all identical, and can be distinguished at a glance from those from Sierra Laguna."

This form is darker and much less gray than my *T. fulvus martirensis*, from the San Pedro Martir Mountains of Lower California, and also very much smaller. The question of whether these two mountain forms should not be treated as specifically distinct, not only from each other but from *T. fulvus*, must be left in abeyance, owing to the absence of proper material to show their relationships.

[1] I take this opportunity to correct an error in the introduction to my paper (this Bull., Vol. X, 1898, p. 143) published last year, in which several species were described from material kindly submitted by Mr. Oldfield Thomas for determination. In the "set of duplicates" retained by this Museum, the types of the new species were not included, as there stated, but were all returned to the British Museum.

Reithrodontomys tenuis, sp. nov.

Similar to *Reithrodontomys fulvescens*, but much smaller and not so gray, with a much less hairy tail.

Above yellowish brown, finely lined with black; sides fulvous, forming a broad lateral line, poorly defined above, very prominent on the cheeks below the eyes. Below soiled grayish white (in one specimen slightly tinged with fulvous), the hairs pale plumbeous at base. Ears dusky externally, reddish within, covered with fine short hairs, with a reddish tuft at the anterior base. Tail grayish brown, slightly darker above than on the sides and below. Feet soiled white.

Total length (collector's measurements) of type, 152 mm.; tail, 81; hind foot, 20; ear, 15. Three specimens (2 ♂ ♂, 1 ♀) measure: Total length, 160 (152–170); tail, 87 (82–90); hind foot, 20; ear, 15.

Type, No. 217, Coll. W. W. Price, ♀ ad., Rosario, Sinaloa, Mexico, March 11, 1897. Collected by P. O. Simons. (Type in British Museum.)

This species is more nearly related to my *R. fulvescens*, from Oposura, Sinaloa, Mexico, than to any other yet described. It is, however, much smaller, being intermediate in size between this species and *R. longicauda*, the total length being 160, and the length of tail 87, as against 176 and 100, respectively, in *R. fulvescens*. The general coloration is also more strongly fulvous above, particularly posteriorly, and there is a tendency to a fulvous tinge below in contrast with the clear white of the lower parts in *R. fulvescens*. It needs no comparison with any member of either the *R. mexicanus* or *R. longicauda* groups. The skull presents nothing diagnostic.

I am indebted to Mr. Oldfield Thomas for the opportunity to examine the three specimens on which this species is based.

Peromyscus texanus subarcticus, subsp. nov.

Peromyscus leucopus arcticus ALLEN, Bull. Am. Mus. Nat. Hist. VII, 1895, 268; *ibid.* VIII, 1896, 252. (Not *arcticus* of Mearns.)

Intermediate in size and coloration between *P. texanus nebrascensis* and *P. texanus arcticus* but very different from either.

Above dusky brown suffused with very pale fulvous, darker and more blackish over the middle of the back, more fulvous on the sides; feet and lower parts pure white; tail sharply bicolor, the middle third above blackish brown; sides and beneath white; ears dusky, narrowly edged with white.

Total length (of type), 165; tail vertebræ, 66; hind foot, 19. Average of three specimens from the type locality (Deerlodge Co., Montana), total length, 162; tail vertebræ, 61; hind foot, 19.2.

Type, $\frac{10107}{8411}$, ♀ ad., Aug. 13, 1894. Collected by Prof. L. L. Dyche.

P. t. subarcticus differs from *P. t. arcticus* in the general effect of the color of the upper parts being dusky brown instead of blackish brown, in the much more heavily clothed tail, and smaller size (in the average of specimens referable to this form). It differs from *P. t. nebrascensis* in being dusky brown above instead of cinnamon brown.

I refer to this form not only the Black Hills (South Dakota) specimens formerly referred by me (*l. c.*) to *arcticus*, but also a series of six specimens collected at Osler, Saskatchewan (received in exchange from Mr. O. Bangs). The latter agree exactly in color with the Montana series of *subarcticus*, but not at all well with the series from the Upper Liard River region in the Stone collection (see above, p. 8), which are fresh, unfaded specimens of true *arcticus*. The Black Hills specimens are not all typical, some of them decidedly approaching *P. t. nebrascensis*, while others are quite like the Montana and Saskatchewan examples. To *subarcticus* must also be referred the specimens from Colorado, Wyoming, and Utah, formerly placed by me under *arcticus* (*l.c.*).

Sciurus chapmani, sp. nov.

Sciurus æstuans hoffmanni ALLEN & CHAPMAN, Bull. Am. Mus. Nat. Hist. V, 1893, 209; *ibid.* IX, 1897, 17. (Not of Peters, 1864.)

Similar to *Sciurus hoffmanni* (Peters) but smaller and differing in color and in cranial characters.

Above nearly uniform dull yellowish brown finely varied with black, the hairs individually plumbeous at base, and annulated on the apical half with pale fulvous and black, with the tip usually black; the sides of the body are uniform with the back, there being no tendency to a darker median band. Below reddish fulvous, varying in different individuals from pale orange to deep reddish orange, lighter on chin and throat. Outer surface of limbs and feet like the dorsal surface; inner surface of same like the ventral surface. Tail dark brown above, the hairs tipped and the edges of the tail fringed broadly with dark chestnut red; the hairs individually are ringed with two bands of pale fulvous alternating with two of black, besides the red tipping, the two outer bands being broader than the two inner; these bands are hidden on the dorsal aspect by the red tips of the hairs, but below are plainly visible.

Total length (collector's measurements) of type, to end of tail vertebræ, 370 mm.; tail vertebræ, 162; hind foot (with claws), 46; ear, 19. A series of 7 adults (2 ♂ ♂, 5 ♀ ♀) measure as follows: total length, 376 (367–390); tail vertebræ, 174 (162–192); hind foot, 46 (44–48); ear, 19 (18–20).

Skull, total length, 49; width behind postorbital processes, 17.6 (average of 5 adult skulls).

Type, No. $\frac{73222}{59300}$, ♂ ad., Caparo, Trinidad, March 19, 1894. Collected by Frank M. Chapman.

This species differs from *Sciurus hoffmanni* (Peters) in being less dark above, in the rather brighter tint of the under parts, and in the red of the tail being of a much darker shade,—chestnut red instead of orange red. It is also somewhat smaller. In *S. chapmani* the rostral portion of the skull is narrower, and the fronto-parietal suture is transverse or a little concave anteriorly, while in *S. hoffmanni* there is a sharp convexity backward at the median line.

Both *S. hoffmanni* and *S. chapmani* differ very strongly from the Brazilian *S. æstuans* in much larger size and much deeper colors, particularly of the underparts and the tail.

The series of Trinidad Squirrels on which the present species is based were referred provisionally in 1893 (*l. c.*) to *Sciurus æstuans hoffmanni* Peters, with the remark that these ten specimens "prove to be much nearer subspecies *hoffmanni* from Costa Rica, both in size and coloration, than to the true *æstuans* of Brazil, although clearly intermediate between the two, as respects both size and coloration." While this statement is true, an examination since of considerable additional material from Costa Rica, Colombia, and Brazil, renders it evident that the Trinidad form is sufficiently distinct to warrant recognition as an insular form of the group. It is furthermore evident that true *æstuans* and *hoffmanni* should be recognized as distinct species. At least I have seen no specimens that connect the two forms.

This species is named for my colleague, Mr. Frank M. Chapman, in recognition of his important contribution to our knowledge of Trinidad mammals and birds.

Article III.—A PROVISIONAL CLASSIFICATION OF THE FRESH-WATER TERTIARY OF THE WEST.

By W. D. Matthew.

The table of formations immediately following was drawn up by the writer under the guidance of Prof. Osborn and Dr. Wortman, for the arrangement of the collections in the American Museum of Natural History, and submitted to the late Prof. Cope and to Prof. W. B. Scott for approval or amendment. The faunal lists appended are made up chiefly from the study of these collections, covering all the formations of the Western Lakes except the Pliocene horizons. A partial essay is made at a critical revision of the species; characteristic and well marked species are in special type, and those considered invalid are in roman. It is quite impossible to make this revision with any approach to completeness, from the fragmentary character of many types and the meagreness of descriptions. The object of the lists is to assist in the correlation and classification of the various basins by showing the characteristic fauna. The exact horizon and locality are therefore given as fully as possible; and to facilitate future comparison of species, the location of each type specimen is given, as far as known to the writer. No bibliography or complete synonymy of the species is included; it would be undesirable in this connection, as well as rendered superfluous by the excellent bibliography of mammals recently published by Prof. Trouessart.

In this preliminary attempt, errors will doubtless be numerous. The writer will be glad to have his attention called to any, that they may be corrected in a subsequent edition. The synonymy of genera and species is necessarily to a considerable extent provisional, and will require revision, especially in the Creodonta and Primates. Some of the results of Dr. Wortman's recent studies on the former group are embodied here.

New genera defined in this list: *Palæictops*, p. 35; *Phlaocyon*, p. 54; *Miolabi* Hay, p. 74.

New species defined: *Palæolagus intermedius*, p. 53; *Phlaocyon leucosteus*, p. 54; *Ictops bullatus*, p. 55; *Aceratherium profectum*, p. 71.

The following names not heretofore used will be defined in

forthcoming articles by Dr. Wortman and the writer : *Palæosinopa veterrima*, n. g. and sp., p. 31 ; *Procynodictis vulpiceps*, n. g. and sp., p. 49 ; *Oxyænodon dysodus*, n. g. and sp., p. 49 ; *Prodaphænus*, n. g., p. 49 ; *Paradaphænus* and *Nothocyon*, p. 62 ; *Pachyæna intermedia*, n. sp., p. 31.

Divisions of the Tertiary Lake-Basins.

Periods.		Formations.	Thickness.	Faunal Divisions.	Lake Basins.
Pleistocene.		Sheridan.	100	Equus.	*Silver Lake* and other localities in Oregon, Nevada, and elsewhere.
Pliocene.		Blanco.	150	Pliauchenia.	
				Hippidium.	*Great Plains* (Niobrara Basin).
Miocene.	Upper.	Loup Fork.	400	Procamelus.	
		Deep River.	150	Cyclopidius.	*Deep River*, Montana.
	Middle.				
	Lower.	John Day.	1000	Diceratherium.	*John Day*, Oregon.
Oligocene.		White River.	800	Protoceras.	*Great Plains* (Sioux Lake).
				Oreodon.	
				Titanotherium.	
Eocene.	Upper.	Uinta.	800	Diplacodon.	*Uinta*, Utah.
				Telmatotherium.	
	Middle.	Bridger.	2000	Uintatherium.	*Upper Green River*, Wyoming.
					Huerfano, Colorado.
	Lower.	Wind River.	800	Bathyopsis.	*Wind River*, Wyoming.
		Wasatch.	2000	Coryphodon.	*Big Horn*, Wyoming.
	Basal.	Torrejon.	300	Pantolambda.	*San Juan*, New Mexico.
		Puerco.	500	Polymastodon.	

Notes on the Lake Basins.

San Juan Basin.—In northwestern New Mexico, on the divide between the Rio Grande and San Juan Rivers. The beds conformably overlie the marine and brackish water Cretaceous (Laramie), and contain fossils confined in the Basal Eocene to three strata, two at the bottom of the Puerco beds, one in the Torrejon. The Wasatch is sparingly fossiliferous throughout.[1]

Big Horn Basin.—In northern Wyoming. No weighty faunal distinctions have been shown to exist in this great mass of sediment, which is sparingly fossiliferous throughout. Buffalo Basin is a subordinate basin, apparently somewhat later than the main basin.[2]

Wind River Basin.—In central Wyoming. Fossils are rather scarce in this basin. All the sediments are later than the Wasatch and earlier than the Bridger.[3]

Huerfano Basin.—In southern Colorado. Osborn has recently shown that the Wind River is represented here as well as the Bridger. There are also overlying sediments of ? Pleistocene age.[4]

Upper Green River Basin.—In southern Wyoming. This includes the Bridger and Washakie, with Middle Eocene fossil mammals, and much larger areas where Green River (= Wind River) and Vermillion Creek (= Wasatch) sediments are the only beds not washed away by the extensive erosion which has taken place. The Vermillion Creek sediments contain fossil mammals in a few localities (Evanston, Black Buttes, etc.), while the Green River shales contain fossil fish in abundance.[5]

Uinta Basin.—In northeastern Utah. The Middle and Upper Eocene beds are underlain by a considerable thickness of sediments, probably of Lower Eocene age, in which no fossils have been found. The three fossiliferous horizons are: *C*, the Upper or True Uinta, explored for fossils by Marsh in 1870 and the Princeton party of 1886; *B*, the Lower Uinta or Telmatotherium Beds; and *A*, probably equivalent to the upper part of the Bridger. The last two horizons were discovered by the American Museum Expedition of 1894.[6]

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[1] Authority, Wortman. See Bull. Amer. Mus. Nat. Hist., 1892, 135; 1897, 259.
[2] Authority, Wortman, Bull. Amer. Mus. Nat. Hist., 1892, 135.
[3] Authority, Wortman, *l. c.*
[4] Bull. Amer. Mus. Nat. Hist., 1897, 247.
[5] Authority, Hayden Survey Reports, etc. Also Wortman (communicated).
[6] Authority, Peterson, Bull. Amer. Mus. Nat. Hist., 1895, 72; Marsh, Amer. Jour. Sci., March, 1871.

Basin of the Great Plains.—The precise relations of the fossiliferous horizons in different parts of this wide area stand in need of further study. The deposits are coëxtensive with the Neocene and Quaternary, but in no place has a continuous section been observed, and the series of fossiliferous horizons is still more incomplete.

The following table is an attempt at correlation of a number of typical sections with the section published by Hayden and Leidy thirty years ago. The proper identification of these divisions has been prevented by a confusion as to the fauna properly belonging to Horizon *D*. The descriptions given by Hayden of the character of the rocks in the several divisions of his section agree accurately with the corresponding divisions observed by the writer in Colorado. But the fauna which Hayden and Leidy ascribe to Horizon *D* was found by the writer in Horizon *C*, while *D* belonged stratigraphically and faunally to the Upper Miocene. The fauna which Leidy ascribes to *C* is a mixture of Oreodon and Protoceras Beds species.

The Middle Miocene does not appear to be represented in any of the sections. The faunal break is least serious in Colorado and Oregon, where a number of genera pass through without more than specific change. Such are, in Colorado, *Anchippus*, *Aceratherium* (sensu stricto), *Merycochœrus*, *? Canis*. In Oregon, *Mesohippus* and probably others.

Another break occurs in the Pliocene, partly if not completely bridged in Texas, but tolerably well marked elsewhere.

It is probable that the Protoceras Beds overlap to some extent on the Lower Miocene John Day. Further study of both and determination of the exact horizons of different species will be necessary to find the extent of the overlap. At present it seems that some lines of descent are more advanced in one basin, some in the other. The Rhinoceroses seem to have run into *Diceratherium* in the John Day, while continuing the line towards *Aphelops* in the Plains. The Camels are more advanced in the western basin, but the Horses are persistently primitive, while *Anchippus* had already appeared in the Leptauchenia Beds. Side branches of Canidæ appear in both basins, while the more direct line shows little difference in age between the two. *Merycochœrus* and *Eporeodon* appear in both, but the relations of

	Neb. & S. Dak. Hayden & Leidy, 1869.		S. Dakota. Wortman, 1895.	N. E. Colorado. Matthew, 1899.	N. W. Kansas & S. W. Nebraska. Matthew, 1899.	N. W. Nebraska. Wortman, 1897.	Deep R., Mont. Scott, 1894.	John Day R., Oregon. Wortman, 1880.	Llano Estacado, Texas. Cope & Cummins, 1892.
	Stratigraphy.	Faunal List.							
Pleistocene.					Prairie Marls.				
					Sand-hills.	Equus Beds.			Equus Beds.
Pliocene.									Blanco.
								Loose gravels.	Palo Duro.
Miocene.	F	F	Loup Fork.		Loup Fork.	Loup Fork.			Loup Fork.
	E			E	(Cretaceous, unconformable under the Loup Fork.)		Upper Beds. (*Ticholeptus*)	Cottonwood beds. (*Protolabis*)	
	?D			D					
	C	? E	Leptauchenia (*sub-zone*)	C			Lower Beds.	Up'r John Day. (*Merycochœrus*)	
		D	Protoceras.					L'r John Day. (*Diceratherium*)	
		C	Up'r Oreodon						
Oligocene.	B	B	L'r Oreodon.	B		(Barren white clays, probably White River.)			
			Up. Titanoth'm						
	A	A	Mid. "	A					
			Low. "						

the species to each other are not yet known. *Leptauchenia* is unknown in the John Day basin, and is very close to the Upper Miocene *Cyclopidius*, but if these genera were aquatic they may have had a peculiar and limited habitat, and their absence would not have much weight.

The so-called Loup Fork Beds are not all strictly of the same age. The more easterly and southerly deposits in Nebraska, Kansas, and Texas are uppermost Miocene or Pliocene. The species described by Leidy and Marsh came chiefly from these beds. The Colorado Loup Fork is a distinctly older horizon, Upper or perhaps in part Middle Miocene. Prof. Cope explored this region in 1873 and 1879 and described its fauna. He seems to have been less familiar with the eastern Loup Fork; and this may partly explain the discrepant views held as to the age of the Loup Fork Tertiary. Williston and some other recent writers entirely refuse to assign a definite age to the Kansas Loup Fork; and the present writer desires to avoid including with the beds to which a definite age is assigned, any but those in which a sufficient fauna has been found. The Colorado Loup Fork is here placed as equivalent to the Deep River of Montana, the Ticholeptus Beds of Cope—an unfortunate name, as *Ticholeptus* is a synonym of *Merychyus*, and *Merychyus* is equally characteristic of the typical Loup Fork or Procamelus Beds. Cope placed with the Deep River the Upper Miocene Beds of the John Day valley, and of Laramie Peak, Wyoming. Other beds on the western and northern margin of the Great Plains basin may be equivalent. Scott considers the Deep River as older than any of the beds above mentioned, laying especial stress on the occurrence of *Cyclopidius* in that basin only. *Cyclopidius*, however, occurs in the extreme west of Nebraska (Cheyenne Co.), and its absence elsewhere may be explained, as above noted, by its aquatic habitat. *Miolabis*[1] characterizes the Colorado Loup Fork and the Oregon beds, and stands well in opposition to *Procamelus* of the upper horizon. The lower beds have been called Cyclopidius Beds.[2] They show the following characteristic faunal differences:

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[1] (= *Protolabis* Wortman, 1898, not Cope.)

[2] On account of its evident inconstancy a name derived from the fauna to designate a particular horizon is less suitable than a geographic term. Pawnee Creek Beds would be a better name for the lower horizon in Colorado, Deep River being used correlatively with Loup Fork for the general designation of the lower beds.

Procamelus Beds.	*Cyclopidius Beds.*
Pliohippus.	Pliohippus.
Protohippus.	Protohippus.
Hipparion.	Hipparion.
? Mesohippus. [1]	Desmatippus.
	Anchippus.
	Anchitherium.
	Mesohippus.
Pliauchenia.	
Procamelus.	Procamelus.
	Protolabis.
	Miolabis.
	Cyclopidius.
Teleoceras.	Aceratherium.
Cosoryx.	Blastomeryx.

That is to say, Horses with short-crowned teeth and Camels with split metapodials persisted into the lower horizon, as did also the aquatic Oreodonts and more primitive Aceratheres. *Blastomeryx* characterized the lower, as *Cosoryx* did the upper horizon. The large *Teleoceras* (*Aphelops*) *fossiger*, unknown in the older horizon, is the most abundant fossil of the later one.

King [2] applied the names 'Sioux Lake' and 'Cheyenne Lake' to the supposed lakes of the Oligocene and Upper Miocene of the Plains (Miocene and Pliocene of older writers); and Marsh [3] has called the latter the Niobrara basin. The deposits cover to a great extent the same area, and a single geographical name may conveniently be used, as is done in the other Tertiary basins.

The White River sediments are usually considered as lacustrine. A similar origin has been assigned to all the later sediments, but recent studies of Gilbert in Arkansas, Williston and others in Kansas, and Darton in South Dakota, tend toward the view that the Loup Fork is chiefly flood-plain sediment while the Pleistocene is flood-plain and æolian deposit.[4] With this view the observations made by the writer in Colorado in 1898 entirely coincide.

John Day Basin.—In central Oregon. Two or three more or less separate basins in the valley of the John Day River. The Cottonwood basin, containing a higher fauna, equivalent to the

[1] Two lower molars referred to *Mesohippus* are described by Scott and Osborn as coming from the true Loup Fork of Nebraska. This is the only occurrence in the Procamelus Beds, as far as I am aware.

[2] 40th Parallel Survey Rep.

[3] Am. Ass. Adv. Sci., Ann. Address, 1872.

[4] Gilbert, 17th Ann. Rep. U. S. Geol. Survey, 1895–6, part II, 575. Williston, Kansas Univ. Geol. Survey, Rep. 1896.

Deep River (Cope and Wortman) or Loup Fork (Scott), is separated from the lower beds by a basaltic flow. Dr. Wortman has recently found sufficient differences in the true John Day to warrant its division into two horizons ; the upper, containing a great abundance of *Merycochœrus*, being exposed at Bridge Creek and elsewhere ; the lower, typical at the locality known as 'The Cove.' [1]

Deep River Basin.—In central Montana. It would seem to be an outlier of the Great Plains basin. The upper beds, containing the typical Deep River fauna, rest unconformably on beds containing a scanty fauna which Scott considers equivalent to the Upper John Day. The facies of the fauna does not seem, however, to forbid placing it as equivalent to the Leptauchenia fauna of the Great Plains.[2]

New Mexico Loup Fork Basins.—A number of small scattered areas, of which the *Santa Fé Basin* in the northern part of the state, and the *San Francisco Basin* in the southwest corner, are the most important. Some of these deposits may be Pliocene.

The PLEISTOCENE fossil beds are scattered over all parts of the West, and cannot be grouped into any definite areas. The Equus Beds, largely river sediments, contain abundant remains of *Equus*. The prairie loess, so far as the writer is acquainted with it, represents a later deposit, æolian, and still in progress. The wind cuts out all exposed places at a very considerable rate, as may be seen by the rapid hollowing out of roads and ploughed fields. The dust is caught by the sodded prairie and spread uniformly over it. The effects of this mode of deposition are characteristic and curious features of the plains. The deposits are over two hundred feet thick in places, and contain remains of *Equus* in the lower layers, but in the upper chiefly *Bison* bones in various stages of fossilization. In the Cordilleras are many dried-up lake basins of small size, in the deposits of which the Equus fauna has been found. Silver Lake in Eastern Oregon is the most noted of these.

[1] Authority, Wortman (communicated). [2] Scott, "Mammalia of the Deep River Beds."

Characteristic Fossil Mammals.

The more important or abundant species are in heavy type ; invalid species in roman. Present location of the type specimen is stated (under the formation in which it was found) as follows :

A. M.....American Museum of Natural History, New York.
U. S.....National Museum, Washington.
Ph.....Philadelphia Academy of Sciences.
Y .....Yale University, New Haven, Conn.
K.....Kansas University, Lawrence, Kan.
H.....Harvard University, Cambridge, Mass.
P.....Princeton University, N. J.
T.....Texas Geological Survey.
C. G. S.....Canadian Geological Survey.

I. *PUERCO.*

All the types and described specimens are preserved in the American Museum of Natural History. The localities of all are in northwestern New Mexico, west of the divide between the Rio Grande and San Juan Rivers.

MULTITUBERCULATA.[1]

PLAGIAULACIDÆ.

Catopsalis foliatus Cope.
Polymastodon taöensis Cope.
Polymastodon latimolis *Cope.*
Polymastodon attenuatus Cope.
" *selenodus* Osborn & Earle.
Neoplagiaulax americanus Cope.
Neoplagiaulax sp.

CREODONTA.

OXYCLÆNIDÆ.

Oxyclænus cuspidatus (Cope.)
" *simplex* (Cope.)
Protochriacus priscus (Cope.)
Protochriacus hyattianus Cope.
Loxolophus adapinus *Cope.*
Protochriacus attenuatus O. & E.

TRIISODONTIDÆ.

Triisodon quivirensis Cope.
" **heilprinianus** Cope.
Triisodon rusticus *Cope.*
Triisodon biculminatus *Cope.*
Conoryctes crassicuspis *Cope.*
Sarcothraustes coryphæus *Cope.*
Mioclænus bathygnathus *Cope.*
Triisodon gaudrianus (Cope).

INCERT. SED.

Oxyacodon apiculatus O. & E.
Oxyacodon agapetillus (Cope).
Carcinodon filholianus (Cope).

CONDYLARTHRA.

PERIPTYCHIDÆ.

Periptychus[1] **coarctatus** Cope.
Periptychus brabensis *O. & E.*
Ectoconus ditrigonus (Cope).
Hemithlæus kowalevskianus Cope.
Conacodon entoconus (Cope).
Anisonchus coniferus *Cope.*
Conacodon cophater (Cope).
Anisonchus gillianus Cope.
Hemithlæus apiculatus *Cope.*
? Zetodon gracilis *Cope.* (Indeterminate.)

PHENACODONTIDÆ.

Protogonodon pentacus (Cope).
Protogonodon stenognathus Matthew.

MIOCLÆNIDÆ.

Mioclænus turgidunculus Cope.

EDENTATA.

STYLINODONTIDÆ.

Hemiganus otariidens Cope.

CONORYCTIDÆ.

Onychodectes tissonensis Cope.
Onychodectes rarus O. & E.

INDETERMINATE SPECIES.

Mioclænus interruptus *Cope.*
" rütimeyeranus *Cope.*

II. *TORREJON.*

All the types and described specimens are preserved in the American Museum of Natural History. The localities are in northwestern New Mexico, on either side of the divide between the Rio Grande and San Juan Rivers.

[1] The name *Periptychus* is perhaps preoccupied by *Periptyches.* If this be the case, the name *Catathlæus*, proposed for the permanent dentition of the same species, takes its place, *C. rhabdodon* being the type.

MULTITUBERCULATA.

PLAGIAULACIDÆ.

Neoplagiaulax molestus Cope.
Ptilodus mediævus Cope.
Ptilodus trovessartianus Cope.

BOLODONTIDÆ.

Chirox plicatus Cope.

PRIMATES.

TARSIIDÆ.

Indrodon malaris Cope.

RODENTIA.

MIXODECTIDÆ.

Mixodectes pungens Cope.
Mixodectes crassiusculus Cope.

CREODONTA.

OXYCLÆNIDÆ.

Tricentes subtrigonus (Cope).
Mioclænus bucculentus *Cope*.
Phenacodus zuniensis *Cope*.
Tricentes crassicollidens Cope.
Chriacus pelvidens (Cope).
Chriacus stenops *Cope*.
Chriacus baldwini (Cope).
Chriacus truncatus Cope.
Chriacus schlosserianus Cope.
Deltatherium fundaminis Cope.

TRIISODONTIDÆ.

Goniacodon levisanus (Cope).
Sarcothraustes antiquus Cope.
Triisodon conidens *Cope*.

MESONYCHIDÆ.

Dissacus navajovius Cope.
Dissacus carnifex *Cope*.
Dissacus saurognathus Wortman.

VIVERRIDÆ.

Viverravus haydenianus (Cope.)
Didymictis primus *Cope*.

ARCTOCYONIDÆ.

Clænodon ferox (Cope).
Clænodon corrugatus Cope.
Clænodon protogonioides Cope.

CONDYLARTHRA.

PERIPTYCHIDÆ.

Periptychus[1] **rhabdodon** Cope.
Periptychus carinidens Cope.
Anisonchus sectorius Cope.
Anisonchus mandibularis (*Cope*).
Haploconus lineatus Cope.
Haploconus xiphodon *Cope*.
" angustus *Cope*.
Haploconus corniculatus Cope.

PHENACODONTIDÆ.

Euprotogonia[2] **puercensis** (Cope).
Phenacodus calceolatus *Cope*.
Protogonia subquadrata *Cope*.
" plicifera *Cope*.
Mioclænus floverianus *Cope*.
Euprotogonia minor Matthew.

MIOCLÆNIDÆ.

Mioclænus turgidus Cope.
Mioclænus zittelianus *Cope*.
Mioclænus lydekkerianus Cope.
Mioclænus lemuroides Matthew.
" **acolytus** (Cope).
Mioclænus inæquidens (Cope).
Mioclænus minimus *Cope*.
Protoselene opisthacus (Cope).
Hemithlæus baldwini *Cope*.

AMBLYPODA.

PANTOLAMBDIDÆ.

Pantolambda bathmodon Cope.
" **cavirictus** Cope.

EDENTATA.

STYLINODONTIDÆ.

Psittacotherium multifragum Cope.
Psittacotherium aspasiæ *Cope*.
" megalodus *Cope*.
Hemiganus vultuosus *Cope*.

CONORYCTIDÆ.

Conoryctes comma Cope.

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[1] See note on p. 28.

[2] Dr. T. S. Palmer has kindly called my attention to the fact that the generic name *Euprotogonia* is antedated by *Tetraclænodon*, a genus of Creodonts founded by Prof. Scott on *Mioclænus floverianus* of Cope, a wrongly interpreted specimen of *Euprotogonia puercensis*. The generic description of *Tetraclænodon* is doubtfully valid, very misleading, and founded on error; the name is inappropriate in the extreme; and I have therefore retained *Euprotogonia* as a well known and appropriate name substituted for the original preoccupied name *Protogonia*.

III. *WASATCH.*

	Big Horn.	Buffalo Basin.	New Mexico.	Location of Type.
PRIMATES.				
Omomys (*Anaptomorphus*) *homunculus* (Cope)	×	×		
Hyopsodus paulus Leidy	×	×		
" **vicarius** Cope	×	×		
" **powellianus** Cope	?			A. M.
Hyopsodus lemoinianus Cope	×	×		"
" *miticulus* Cope			×	U. S.
" *laticuneus* [1] (Cope)	?			A. M.
Pelycodus frugivorus Cope	×		×	
Pelycodus nunienus *Cope*	×			
Pelycodus tutus Cope	×		×	
Pelycodus jarrovii Cope	×		×	
" *angulatus* Cope	×			A. M.
Microsyops? gracilis Leidy	×			
" *speirianus* Cope	×			A. M.
Cynodontomys latidens Cope	×			"
RODENTIA.				
ISCHYROMYIDÆ.				
Paramys buccatus Cope	×		×	
" **delicatior** Leidy		×		
" **delicatissimus** Leidy	×	×		
CREODONTA.				
VIVERRIDÆ.				
Viverravus [2] **protenus** (Cope)	×	×	×	U. S.
" **leptomylus** [3] (Cope)	×	×		
Viverravus curtidens (Cope)	×			A. M.
" *massetericus* (Cope)	×			"
" *gracilis* Marsh	×			
Uintacyon (Miacis [4]) **canavus** (Cope)	×			A. M.
Uintacyon (Miacis) *brevirostris* (Cope)	×	×		"
" " *sp*		×		"

[1] The premolars associated with the type and only specimen of *Diacodexis laticuneus* Cope, are those of *Hyracotherium index;* the upper and lower molars belong to *Hyopsodus*, closely allied to *H. powellianus*. See Wortman, Bull. Am. Mus. Nat. Hist., 1896.

[2] *Viverravus* as defined by Marsh in 1872 covers *Didymictis* Cope, 1874. See note on p. 35.

[3] The type of *Didymictis leptomylus* of Cope may be the same as Marsh's *Limnocyon riparius* of the Bridger. This Wasatch species was referred by Cope to *leptomylus* but is probably distinct from the type.

[4] These species are considerably different in type from the Bridger species to which the name was originally given.

III. Wasatch.—*Continued.*

	Big Horn.	Buffalo Basin.	New Mexico.	Location of Type.
PROVIVERRIDÆ.				
Palæosinopa veterrima Wortman [1]	×			A. M.
Sinopa (Stypolophus) **hians** (Cope)	×		×	U. S.
" " **strenua** (Cope)	×		×	"
" " **whitiæ** (Cope)	×	×		
" " **viverrina** (Cope)	×		×	U. S.
Sinopa (Stypolophus) *multicuspis* (Cope)			×	"
" " *secundaria* (Cope)			×	"
" " *aculeata* (Cope)[2]				P.
OXYÆNIDÆ.				
Oxyæna lupina Cope	×	×	×	U. S.
" **forcipata** Cope	×		×	"
Oxyæna morsitans Cope			×	"
PALÆONICTIDÆ.				
Palæonictis occidentalis Osborn and Wortman	×			A. M.
Amblyctonus sinosus Cope			×	U. S.
MESONYCHIDÆ.				
Pachyæna[3] **ossifraga** (Cope)	×		×	U. S.
Pachyæna intermedia Wortman [1]	×			A. M.
Pachyæna gigantea Osborn and Wortman	×			"
Dissacus leptognathus O. & W	×	×		"
ARCTOCYONIDÆ.				
Anacodon ursidens Cope		×		A. M.
INCERTÆ SEDIS.				
Didelphodus absarokæ Cope	×			A. M.
Didelphys comstocki (Cope) [4]	×			"
Diacodon celatus Cope			×	U. S.
" *alticuspis* Cope			×	"
INSECTIVORA.				
LEPTICTIDÆ.				
Palæictops[5] *? bicuspis* (Cope)	×			
TILLODONTIA.				
ESTHONYCHIDÆ.				
Esthonyx[6] **burmeisteri** Cope	×	×	×	U. S.
Esthonyx acer Cope			×	"
" *bisulcatus* Cope			×	"
" *spatularius* Cope			×	"

[1] Unpublished.

[2] The original type from the Bridger was indeterminate. The species properly dates from Cope's description in 1884 (Tert. Vert.) of a specimen in the Princeton Museum referred to *S. aculeata*.

[3] Unworn molars of *Pachyæna* show that it possessed a vestigial metaconid, though less distinct than that of *Dissacus;* the original ground for the separation of the two therefore fails. I retain them separate however, believing that a careful comparison will show distinctions of generic importance between them.

[4] Generic position very doubtful.

[5] See note on p. 35.

[6] The species of *Esthonyx* need revision.

III. WASATCH.—*Continued.*

	Big Horn.	Buffalo Basin.	New Mexico.	Location of Type.
EDENTATA.				
STYLINODONTIDÆ.				
Calamodon simplex Cope	×		×	U. S.
Calamodon arcamœnus *Cope*			×	"
Calamodon novomehicanus *Cope*			×	"
Dryptodon crassus *Marsh*			×	"
CONDYLARTHRA.				
PHENACODONTIDÆ.				
Phenacodus primævus Cope [1]	×		×	A. M.
Phenacodus omnivorus *Cope*			×	U. S.
Phenacodus nunienus Cope [2]	×			A. M.
Phenacodus wortmani Cope [3]	×		×	
Phenacodus apternus *Cope*	×			A. M.
Phenacodus hemiconus Cope. [4]	×			"
Phenacodus brachypternus Cope	×	×		"
Phenacodus macropternus Cope	×			"
" *sulcatus* Cope			×	U. S.
" (Ectocion) *osbornianus* Cope	×			A. M.
Eohyus [5] distans *Marsh*			×	Y.
" robustus *Marsh*			×	"
MENISCOTHERIIDÆ.				
Meniscotherium chamense Cope.			×	U. S.
" **terræ-rubræ** Cope.			×	A. M.
Meniscotherium tapiacitis Cope			×	"
Hyracops socialis Marsh [6]			×	Y.

[1] Type from Evanston, Wyoming.

[2] Perhaps a small variety of *P. primævus.*

[3] See note on this species on p. 36.

[4] Doubtfully distinguishable from *P. nunienus.*

[5] *Eohyus* Marsh (nom. nud., 1877) is perhaps a synonym of *Phenacodus; E. distans* (figured, 1894) might be taken for the very uncharacteristic m^3 of that genus, and the description of *E. robustus* (1894) corresponds as far as it goes to the lower jaw of *P. primævus.* Wortman (Bull. Am. Mus. Nat. Hist., 1898, p. 101, foot-note) believes that *E. distans* is founded on the last upper molar of *Trigonolestes etsagicus;* but the tooth as figured by Marsh is too large for that species, even on the supposition that m^3 is unreduced, which, judging from the reduction of the heel of m_3, is not the case.

[6] *Hyracops*, which has been identified by Osborn with *Meniscotherium*, differs considerably in its foot structure if Marsh's figures are accurate. The large magnum, the entirely serial carpus, and the epicuneiform seen in Marsh's figures of *Hyracops* are not present in *Meniscotherium*, which has a carpal and tarsal structure very like that of *Euprotogonia*, with small magnum, lunar supported partly on unciform, and other normal primitive features. The metapodials and phalanges are like those of *Hyracops.*

III. Wasatch.—*Continued.*

	Evanston, Wyo.	Big Horn.	Buffalo Basin.	New Mex.	Location of Type.
AMBLYPODA.					
CORYPHODONTIDÆ.					
Coryphodon (Bathmodon) *radians* Cope	×				A. M.[1]
Coryphodon (Metalophodon) **testis** (Cope)		×			"
Coryphodon repandus *Cope*		×			"
Coryphodon lobatus Cope		×	×	×	U. S.
Coryphodon anax *Cope*		×			A. M.
Bathmodon pachypus *Cope*		×			"
Coryphodon elephantopus Cope		×	×	×	U. S.
Coryphodon obliquus *Cope*				×	"
Coryphodon cuspidatus *Cope*		×		×	"
Coryphodon hamatus Marsh	×				Y.
Manteodon subquadratus *Cope*		×			A. M.
Coryphodon latidens Cope		×		×	U. S.
Coryphodon simus *Cope*				×	"
" molestus *Cope*				×	"
Coryphodon curvicristis Cope		×			A. M.
" (Metalophodon) *armatus* (Cope). Black Buttes, Wyo.					"
" (Ectacodon) *cinctus* (Cope)		×			"
Coryphodon latipes *Cope*.[2]	×				"
" marginatus *Cope*.[2]		×			"
PERISSODACTYLA.					
EQUIDÆ.					
Hyracotherium (Eohippus[3]) index Cope	×	×	×	×	A. M.
Hyracotherium angustidens *Cope*				×	U. S.
" cuspidatum *Cope*				×	"
Eohippus pernix *Marsh*	×				Y.
Hyracotherium (Eohippus) vasacciense Cope.	×	×			A. M.
Eohippus validus *Marsh*				×	Y.
Hyracotherium (Eohippus) tapirinum Cope		×		×	U. S.
Hyracotherium (*Eohippus*) *cristatum* Wortman		×			A. M.
" (*Pliolophus*) *cristonense* Cope			×	×	U. S.
" " *montanum* Wortman		×			A. M.
LOPHIODONTIDÆ.					
Heptodon posticus Cope		×			A. M.
" *singularis* Cope				×	U. S.

[1] Part of the same individual is in the Yale University Museum.

[2] Indeterminate types, synonymy doubtful.

[3] In *Hyracotherium* proper, p^2 has but one cusp; in all the American species, a trittocone is also present. "It may yet be found that there are other important differences between these groups which will necessitate recognizing a separate genus for the American forms, in which event the name *Eohippus*, proposed by Marsh, would have to be adopted." Wortman, Bull. Am. Mus. Nat. Hist., 1896, 101.

III. WASATCH.—*Continued.*

	Evanston, Wyo.	Big Horn.	Buffalo Basin.	New Mex.	Location of Type.
TAPIRIDÆ.					
Systemodon protapirinus Wortman		×	×		A. M.
Systemodon primævus Wortman		××			"
" *semihians* Cope		×			"
ARTIODACTYLA.					
HOMACODONTIDÆ.					
Trigonolestes chacensis Cope.[1]		×		×	U. S.
Trigonolestes brachystomus Cope		××			A. M.
" *nuptus* Cope		×××			"
" *metsiacus* Cope		×××			"
" *etsagicus* Cope		×			"
ACHÆNODONTIDÆ.					
Parahyus vagus Marsh	×				Y.
" *aberrans* Marsh	×				"

IV. *WIND RIVER.*

All the types and described specimens are in the American Museum of Natural History.

	Wind River, Wyoming.	Huerfano, Colorado.	Location of Type.
PRIMATES.			
Hyopsodus paulus Leidy	×		
" **vicarius** Cope	××		
Hyopsodus ? lemoinianus Cope	×		
" *? powellianus* Cope		××	
Pelycodus tutus Cope	×	×	
Pelycodus frugivorus Cope	××		
Pelycodus nunienus *Cope*	×		A. M.
Microsyops gracilis Leidy	××		
Microsyops scottianus Cope [2]	×		A. M.

[1] This is the common species of *Trigonolestes*. The others are founded on somewhat smaller or otherwise different individuals, but all very closely allied except *T. etsagicus*, which differs widely and may have to be separated generically, as Wortman has suggested (Extinct Camelidæ of North America, Bull. Am. Mus. Nat. Hist., 1898, p. 101, foot-note). I have seen no specimen of *Trigonolestes* proper (our collection contains 26) in which the paraconid is not present and twined with the metaconid in a peculiar way.

[2] Doubtfully distinguishable from *M. gracilis*.

IV. Wind River.—*Continued.*

	Wind River, Wyoming.	Huerfano, Colorado.	Location of Type.
RODENTIA.			
ISCHYROMYIDÆ.			
Paramys delicatior Leidy	×	×	
" **delicatissimus** Leidy	×		
CREODONTA.			
VIVERRIDÆ.			
Viverravus[1] (Didymictis) **altidens** (Cope)	×		A. M.
Viverravus (Didymictis) *protenus* (Cope)	×	×	
" (Limnocyon) *riparius* (Marsh)			
? Didymictis leptomylus *Cope*, type only	×		A. M.
Viverravus gracilis Marsh	×	×	
Didymictis dawkinsianus *Cope*	×		A. M.
Uintacyon (Miacis) **canavus** (Cope)	×		"
" " **brevirostris** (Cope)	×		"
Uintacyon (Miacis) *cf. vorax* Leidy	×		
Uintacyon sp. minima		×	
PROVIVERRIDÆ.			
Sinopa (Stypolophus) **whitiæ** (Cope)			A. M.
Sinopa, cf. viverrina (Cope)[2]			"
OXYÆNIDÆ.			
Oxyæna huerfanensis Osborn		×	A. M.
Patriofelis tigrinus (Cope)	×		"
INSECTIVORA.			
LEPTICTIDÆ.			
Palæictops[3] *bicuspis* (Cope)	×		A. M.
" *didelphoides* (Cope)[4]	×		"
CHIROPTERA.			
Vesperugo anemophilus Cope	×		[5]
? Chiropter indet		×	A. M.

[1] *Viverravus* Marsh antedates *Didymictis* Cope, and refers to the same genus. The generic description appears to the writer to be a sufficient one, although Marsh in this as in other descriptions uses the term "tubercular" to describe a tuberculo-sectorial tooth.

[2] Apparently a different species from the Big Horn specimens referred to *S. viverrina*. I have not compared either with the type, from New Mexico.

[3] Referred by Cope to *Ictops*, an Oligocene genus closely allied to *Leptictis* Leidy. Though not distinguishable by the dentition from *Ictops*, there are important and very constant differences in the skull characters, among which I select for generic definition the backward extension and broadening of the posterior ends of the nasal bones, and the presence of a single median crest on the cranium instead of the two parallel crests of *Ictops* and *Leptictis*.

[4] Pertinence of this species to the genus very doubtful.

[5] Type lost.

IV. Wind River.—*Continued.*

	Wind River, Wyoming.	Huerfano, Colorado.	Location of Type.
TILLODONTIA.			
ESTHONYCHIDÆ.			
Esthonyx acutidens Cope	×		A. M.
Esthonyx spatularius Cope	×		"
EDENTATA.			
STYLINODONTIDÆ.			
Stylinodon (*Calamodon*) *cylindrifer* (Cope)	×		
CONDYLARTHRA.			
PHENACODONTIDÆ.			
Phenacodus ? primævus Cope [1]	×		
Phenacodus wortmani Cope [2]	×		A. M.
Phenacodus (Ectocion) **osbornianus** Cope	×		
AMBLYPODA.			
CORYPHODONTIDÆ.			
Coryphodon ventanus Osborn	×	×	A. M.
Coryphodon wortmani Osborn	×		"
" *? singularis* Osborn	×		"
UINTATHERIIDÆ.			
Bathyopsis fissidens Cope	×		A. M.
PERISSODACTYLA.			
EQUIDÆ.			
Hyracotherium craspedotum Cope	×		A. M.
Protorohippus (Hyracotherium) venticolus (Cope)	×	×	"
Lambdotherium popöagicum Cope [3]	×	×	"
LOPHIODONTIDÆ.			
Heptodon calciculus Cope	×		"
Heptodon ventorum Cope	×		"
TITANOTHERIIDÆ.			
Telmatotherium (Palæosyops) boreale (Cope)	×		
Lambdotherium brownianum *Cope*	×		
ARTIODACTYLA.			
HOMACODONTIDÆ.			
Trigonolestes secans Cope [4]	×	×	A. M.

[1] The single jaw fragment referred to this species differs in several particulars from the Wasatch specimens.

[2] Two or three species are apparently included under this name, but the material is too fragmentary for their separation. The Wind River specimens, including the type, are, I believe, distinct from those of Wasatch age, including the complete skeleton described by Cope in 'Tertiary Vertebrata.' Two points of difference are the internal instead of postero-internal position of *de* on p^3, and the more compressed p^4—both points approximating the Wind River species to *Ectocion*, the most advanced of the Phenacodonts.

[3] See Osborn, Am. Nat., 1897.

[4] Upper molars being unknown this species can be placed in *Trigonolestes* only provisionally.

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
?PRIMATES.																
Hyopsodus paulus Leidy		×		×	×		×				×	×		×	×	U. S.
Lemuravus distans *Marsh*							×									Y.
Hyopsodus vicarius Cope							×									A. M.
Hyopsodus gracilis Marsh																
" *minusculus* Leidy						×										Ph.
Microsus cuspidatus Leidy								×								U. S.
Microsyops gracilis Leidy																
Microsyops (Limnotherium) **elegans** Marsh	×			×	×											Y.
Notharctus tenebrosus Leidy [1]								××								U. S.
Tomitherium rostratum *Cope*					×		×	×								A. M.
Notharctus (Limnotherium) *tyrannus* (Marsh)						×										Y.
" " *affinis* (Marsh)				××												"
Hipposyus formosus Leidy			×	×												Ph.
" *robustior* Leidy					×											U. S.
Thinolestes anceps Marsh											×					Y.
Telmatolestes crassus Marsh					××											"
Bathrodon typus Marsh				×												"
" *annectens* Marsh					×											"

[1] *Notharctus*, *Limnotherium*, and *Tomitherium* are probably synonymous, *Notharctus* having priority. The specific synonymy has not been cleared up.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
Antiacodon venustus Marsh					×											Y.
Hemiacodon nanus Marsh [1]					×											"
" *gracilis* Marsh					×											"
" *pucillus* Marsh				×												"
Omomys carteri Leidy										×						Ph.
Anaptomorphus æmulus Cope									×							A. M.
Washakius insignis *Leidy*											×					Ph.
Palæacodon verus Leidy																"
" *vagus* Marsh					×											Y.
Mesacodon speciosus Marsh					×											"
Sarcolemur pygmæus Cope							×									A. M.
Sarcolemur furcatus *Cope*											×					"
Prosinopa [2] (*Sinopa*) *eximia* (Leidy)				×												Ph.
RODENTIA.																
ISCHYROMYIDÆ.																
Paramys [3] **delicatus** Leidy			×					×								Ph.
" **delicatior** Leidy			×				×									"

[1] Marsh states that *Antiacodon nanus* (? = *Hemiacodon nanus*) is synonymous with *Anaptomorphus æmulus;* but the description and measurements of *H. nanus* do not bear out this statement. It is possibly a synonym of *Omomys carteri*, but the synonymy of these Bridger Primates is very uncertain, as the descriptions are inadequate, and the types have not been compared.

[2] Proposed by Trouessart, Cat. Mam.

[3] The number of species should probably be reduced.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.											Washakie.			
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Location of Type.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.
Paramys delicatissimus Leidy												Ph.				
" **robustus** Marsh												Y.				
Paramys buccatus (Cope)												A. M.				
" *superbus* S. & O												P.				
" *hians* (Cope)												A. M.				
" *leptodus* Cope												"		?		
Paramys (Sciuravus) **undans** (Marsh)												Y.				
Paramys (Sciuravus) *nitidus* (Marsh)												"				
" " *parvidens* (Marsh)												"				
Tillomys senex Marsh												"				
" *parvus* Marsh												"				
Taxymys lucaris Marsh												"				
Colonomys celer Marsh												"				
Apatemys bellus Marsh												"				
" *bellulus* Marsh												"				
Mysops (*Syllophodus*) *minimus* Leidy												Ph.				
" " *fraternus* Leidy												"				
CREODONTA.																
VIVERRIDÆ.																
Vulpavus palustris Marsh												Y.				
Miacis parvivorus Cope												A. M.				

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
Uintacyon edax Leidy					×						×					Ph.
" *vorax* Leidy																U. S.
" (Miacis) *bathygnathus* (Scott)																P.
Viverravus gracilis Marsh				×	×											Y.
Viverravus nitidus Marsh					×											"
Viverravus (Limnocyon) **riparius** (Marsh)				×												"
Ziphacodon rugatus Marsh					××											"
Harpalodon sylvestris Marsh					××											"
" *vulpinus* Marsh																"
" *Canis*" [1] *montanus* Marsh				×												"
PROVIVERRIDÆ.																
Sinopa rapax Leidy			×													Ph.
Sinopa (Limnocyon) **vera** (Marsh)			××													Y.
" " **agilis** (Marsh)				××												"
Stypolophus brevicalcaratus *Cope*								×								A. M.
Sinopa (Stypolophus) **pungens** (Cope)							×									"
Stypolophus insectivorus *Cope*.[2]								×								"
Proviverra americana Scott											××					P.
Thinocyon velox Marsh																Y.

[1] Probably *Viverravus* or *Miacis*.

[2] Indeterminate type.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
OXYÆNIDÆ.																
Patriofelis ulta Leidy	×		×													U. S.
" (Limnofelis) **ferox** (Marsh)				××												Y.
Patriofelis (Limnofelis, Oracodon) *latidens* Marsh				××												"
? PALÆONICTIDÆ.																
Ælurotherium (*Patriofelis*) *leidyanum*, O. & W																U. S.
MESONYCHIDÆ.																
Mesonyx obtusidens Cope			×							×						A. M.
" (Synoplotherium) *lanius* Cope													×			"
" (Dromocyon) *vorax* (Marsh)[1]																Y.
INDET.																
Triacodon[2] *fallax* Marsh				×												Y.
" *grandis* Marsh					×											"
" *nanus* Marsh				×												"
INSECTIVORA.																
Centetodon pulcher Marsh				××												Y.
" *altidens* Marsh				××												"

[1] Scott identifies this species with *Mesonyx obtusidens*. It probably represents a distinct species, as the last lower molar is very much reduced, according to the measurements given.

[2] Probably Proviverridæ or Viverridæ.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.												Washakie.						Location of Type.
		Fort Bridger.	Spanish John's.	Big Bone Butte.	Sage Creek.	Cat-tail Spring.	Grizzly Buttes.	Dry Creek.	Henry's Fork.	Cottonwood Creek.	Camp Spring.	Tule Spring.	Twin Buttes.	Unrecorded.	Barrel Spring.	Dug Spring.	Mammoth Buttes.	Haystack Mtn.	La Clede.	Unrecorded.	
Passalacodon littoralis Marsh																				Y.
Anisacodon elegans Marsh																				"
Centracodon delicatus Marsh																				"
Entomodon comptus Marsh																				"
Entomacodon minutus Marsh																				"
" *angustidens* Marsh																				"
Euryacodon lepidus Marsh																				"
Talpavus nitidus Marsh																				"
CHIROPTERA.																				
Nyctitherium velox Marsh																				[1] Ph.
" *priscum* Marsh																				Y.
Nyctilestes serotinus Marsh																				Y.
TILLODONTIA.																				
ESTHONYCHIDÆ.																				
Anchippodus riparius Leidy		×											×							Y.
" *vetulus* Leidy		×											?							Y.
" *minor* (Marsh)																				"
Trogosus castoridens *Leidy*																				"
Tillotherium hyracoides Marsh																				"

[1] Type from Monmouth Co., N. J.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.													Washakie.						Location of Type.
		Fort Bridger.	Spanish John's.	Big Bone Buttes.	Sage Creek.	Cat-tail Spring.	Grizzly Buttes.	Dry Creek.	Henry's Fork.	Cottonwood Creek.	Camp Spring.	Tule Spring.	Twin Buttes.	Unrecorded.	Barrel Spring.	Dug Spring.	Mammoth Buttes.	Haystack Mtn.	La Clede.	Unrecorded.	
Tillotherium fodiens Marsh	×													?							Y.
Tillotherium latidens Marsh														?							"
EDENTATA.																					
STYLINODONTIDÆ.																					
Stylinodon mirus Marsh														?							Y.
AMBLYPODA.																					
UINTATHERIIDÆ.																					
Uintatherium[1] **robustum** Leidy								×	×												Ph.
Uintamastix atrox *Leidy*																					"
Uintatherium (Dinoceras) mirabile (Marsh)				×	×		×		×		×	×		×		×		×		×	Y.
Uintatherium (*Dinoceras*) *agreste* (Marsh)			×																		"
" " *cuneum* (Marsh)				×																	"
" " *distans* (Marsh)														×				×			"
" " *laticeps* (Marsh)									×												"
" " *lucare* (Marsh)				×																	"
" " *reflexum* (Marsh)												×									"
" (*Tinoceras*) *anceps* (Marsh)					×																"
" " *affine* (Marsh)																×					"
" " *annectens* (Marsh)																		×			"
" " *crassifrons* (Marsh)						×															"

[1] Pending a revision of the genera and species of this family, it is convenient to group them provisionally under the first described genus, *Uintatherium* Leidy.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.												Washakie.						Location of Type.
		Fort Bridger.	Spanish John's.	Big Bone Buttes.	Sage Creek.	Cat-tail Spring.	Grizzly Buttes.	Dry Creek.	Henry's Fork.	Cottonwood Creek.	Camp Spring.	Tule Spring.	Twin Buttes.	Unrecorded.	Barrel Spring.	Dug Spring.	Mammoth Buttes.	Haystack Mtn.	La Clede.	Unrecorded.	
Uintatherium (Tinoceras) grande (Marsh)															×						Y.
Uintatherium (*Tinoceras*) *hians* (Marsh)						×															"
Uintatherium (Tinoceras) ingens (Marsh)														×				×		×	"
Uintatherium (*Tinoceras*) *jugum* (Marsh)																					"
" " *lacustre* (Marsh)			×														?				"
" " *latum* (Marsh)																					"
Uintatherium (Tinoceras) longiceps (Marsh)[1]																				×	"
Uintatherium (*Tinoceras*) *pugnax* (Marsh)																		××			"
" " *stenops* (Marsh)[2]																		××			"
" " *vagans* (Marsh)[1]																					"
Uintatherium (Loxolophodon) cornutum Cope																	××				A. M.
Uintatherium (*Loxolophodon*) *galeatum* Cope																	××				"
" " *speirianum* S. & O																					P.
" (*Eobasileus*) *furcatum* Cope																	××				A. M.
" " *pressicorne* Cope																	××				"
" (*Elachoceras*) *parvum* Scott																					P.
Uintatherium alticeps S. & O.														×							"
Uintatherium princeps S. & O									×												"
" *latifrons* Marsh				×																	Y.
" *leidianum* S. & O								×													P.
" *segne* Marsh		×																			Y.

[1] From Red Dog Buttes.

[2] Cf. *U. ingens.*

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
PERISSODACTYLA.																
EQUIDÆ.																
Hyracotherium osbornianum Cope								×								A. M.
" *procyoninum* Cope							×									"
Helohippus pumilus Marsh																Y.
Orohippus uintanus (Marsh)					×											"
" *major* Marsh											? ×					"
" *pumilus* Marsh				×			×									"
Orohippus agilis Marsh											? ×					"
Orohippus sylvaticus (Leidy)					×											U. S.
Anchitherium ballardi *Marsh*				×												Y.
Oligotomus cinctus Cope							×									A. M.
LOPHIODONTIDÆ.																
Helaletes böops Marsh,				×				×							1	Y.
" *guyoti* (Scott)																P.
" *minusculus* (Scott)																"
" *nanus* (Marsh) Leidy		×			×		×									
TAPIRIDÆ.																
Isectolophus latidens (S. & O.)					×											P.

[1] Dug Springs.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.									Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
HYRACODONTIDÆ.																
Hyrachyus agrarius Leidy	×	×	×	×	×	×	×	×		×	×					U. S.
Hyrachyus agrestis *Leidy*								×								"
Hyrachyus eximius Leidy					×	×	×									Ph.
Lophiodon bairdianus *Marsh*[1]																Y.
Hyrachyus princeps Marsh					×								×			"
" *modestus* Leidy			×													U. S.
" *imperialis* Scott, Speir & Osborn,					×		×									P.
" *paradoxus* " " "					×		×									"
" *implicatus* Cope													×			A. M.
Hyrachyus intermedius *S. & O.*							×									P.
" crassidens *S. & O.*					×											"
Triplopus cubitalis Cope															[2] ×	A. M.
" *amarorum* Cope															[2] ×	"
Colonoceras agrestis Marsh																Y.
AMYNODONTIDÆ.																
Amynodon antiquus (S. & O.)															×	P.
TITANOTHERIIDÆ.																
Palæosyops paludosus Leidy	×				×		×	×		×	× [3]					U. S.
Limnohyus robustus *Marsh*					×											Y.

[1] Recorded as from Bridger and Uinta beds. Size = *H. eximius.*

[2] South Bitter Creek.

[3] Type from Church Buttes.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
Limnohyus diaconus *Cope*					×											A. M.
Palæosyops major *Leidy*						×										
Palæosyops laticeps Marsh										×	1	×			×	Y.
Palæosyops lævidens *Cope*							×						×			A. M.
" minor *Earle*																
Palæosyops manteoceras Osborn MS					×					×	×	×		×		A. M.
(Palæosyops vallidens *Osborn*,[2] not Cope)																
Telmatotherium validum Marsh[3]															×	Y.
Telmatotherium hyognathum *S. & O.*															×	P.
Telmatotherium vallidens (Cope)													×			A. M.
" *cultridens* S. & O					×					×						P.
Telmatotherium megarhinum Earle					×					×	×			×	×	"
? Palæosyops fontinalis *Cope*[4]											×					A. M.
? " longirostris *Earle*											×					P.
? Palæosyops humilis Leidy[5]																
? " *junius* Leidy[5]																Ph.
ARTIODACTYLA.																
? CAMELIDÆ.																
Ithygrammodon cameloides S. & O																P.

[1] Type from Marsh's Fork. [2] Bull. Am. Mus. Nat. Hist., 1895, 87. [3] *Telmatherium validus* in the original description.
[4] Indeterminate. Milk dentition, probably of *T. megarhinum*. [5] Indeterminate. May be dwarfed or milk teeth of this or some other species.

V. BRIDGER.—*Continued.*

	Huerfano Basin.	Bridger Basin.										Washakie.				Location of Type.
		Lodge Pole Trail.	Fort Bridger.	Grizzly Buttes.	Henry's Fork.	Dry Creek.	Cottonwood Creek.	Black's Fork.	Ham's Fork.	Twin Buttes.	Unrecorded.	Haystack Mtn.	Mammoth Buttes.	La Clede.	Unrecorded.	
HOMACODONTIDÆ.																
Homacodon vagans Marsh[1]																Y.
Nanomeryx caudatus Marsh																"
Helohyus plicodon Marsh																"
" *validus* Marsh																"
" *lentus* Marsh																"
Stenacodon rarus Marsh					×											Y.
ACHÆNODONTIDÆ.																
Achænodon insolens Cope															[2] ×	A. M.
" *robustus* Osborn	Lower Bridger.															P.
"*Platygonus*" *Ziegleri* Marsh																Y.
INDET.																
Pantolestes longicaudus Cope[3]								×								A. M.

[1] Aug. 3, 1872. If *Pantolestes* is an Artiodactyl, it may be a synonym of this genus.
[2] South Bitter Creek.
[3] Aug. 7, 1872. The supposed position of this species among the Artiodactyla rests entirely on the general resemblance of the teeth (much worn in the type specimen), and especially of $p_{\frac{4}{4}}$, to those of *Trigonolestes*. Characters of associated fragments do not favor the reference, tending rather to place it where Cope originally referred it, among the Primates.

VI. *UINTA.*

	Horizon A.	Horizon B.	Horizon C.	Location of Type.
PRIMATES.				
Hyopsodus gracilis Marsh			×	
Hyopsodus sp.			×	
Microsyops uintensis Osborn		×		A. M.
RODENTIA.				
Paramys sciuroides S. & O.			×	P.
Paramys uintensis Osborn		×		A. M.
Protoptychus hatcheri Scott				P.
CREODONTA.				
CANIDÆ.				
Miacis vulpinus Scott			×	P.[1]
Prodaphænus scotti[2]				
Prodaphænus (Miacis) **uintensis** (Osborn)		×	×	A. M.
Procynodictis vulpiceps[2]				"
OXYÆNIDÆ.				
Oxyænodon dysodus[3]		×	×	"
MESONYCHIDÆ.				
Mesonyx, cf. *obtusidens* Cope		×		
Mesonyx uintensis Scott		×	×	P.
AMBLYPODA.				
UINTATHERIIDÆ.				
Uintatherium sp.	×	×		
PERISSODACTYLA.				
EQUIDÆ.				
Epihippus uintensis Marsh			×	Y.
Epihippus gracilis (Marsh)			×	"
LOPHIODONTIDÆ.				
Helaletes guyotii Scott		×		P.
TAPIRIDÆ.				
Isectolophus annectens S. & O.			×	"

[1] Type mislaid or lost.

[2] Unpublished.

[3] Unpublished. See Osborn, Bull. Am. Mus. Nat. Hist., 1896, 78, fig. 3 (*Hyænodon*).

VI. UINTA.—*Continued.*

	Horizon A.	Horizon B.	Horizon C.	Location of Type.
HYRACODONTIDÆ.				
Triplopus obliquidens S. & O.			×	P.
Prothyracodon intermedium *S. & O.*				
Triplopus sp. (? = *Lophiodon bairdianus* Marsh, part).			×	
AMYNODONTIDÆ.				
Amynodon advenus Marsh.			×	Y.
Amynodon intermedius S. & O.			×	P.
TITANOTHERIIDÆ.				
Telmatotherium cornutum Osborn.		×		A. M.
Telmatotherium diploconum Osborn.		×		"
Telmatotherium ? diploconum, var. minus [1].		×		"
Telmatotherium hyognathum S. & O.		×	×	P.
Palæosyops manteoceras Osborn [2].	×	×	×	A. M.
" **ultimus** Osborn [2].			×	"
Diplacodon elatus Marsh			×	Y.
Diplacodon emarginatus Hatcher.			×	P.
Diplacodon sp. indesc.			×	A. M.
ARTIODACTYLA.				
HOMACODONTIDÆ.				
Bunomeryx montanus Wortman.			×	A. M.
Bunomeryx elegans Wortman.			×	"
CAMELIDÆ.				
Protylopus petersoni Wortman.			×	A. M.
Leptotragulus proavus S. & O.		×	×	P.
Parameryx lævis Marsh.			×	Y.
" *sulcatus* Marsh.			×	"
Camelomeryx longiceps Scott.			×	P.
OREODONTIDÆ.				
Leptoreodon marshi Wortman.		×	×	A. M.
Merycodesmus gracilis *Scott.*			×	P.
Eomeryx (Protoreodon) **parvus** (S. & O.).			×	"
Eomeryx sp. major indesc.			×	
" *pumilus* Marsh.			×	Y.
Agriotherium paradoxicum Scott			×	P.
Hyomeryx breviceps Marsh.			×	Y.
Oromeryx plicatus Marsh.			×	"
ACHÆNODONTIDÆ.				
Protelotherium uintense (Osborn).		×		A. M.
Achænodon sp. (*A. insolens*, fide Osborn).		×		
INCERTÆ SEDIS.				
Sphenocælus uintensis Osborn		×		A. M.

[1] Unpublished. Heretofore confounded with *T. megarhinum.*

[2] Unpublished.

VII. *WHITE RIVER.*

The localities tabulated below are :

1. *Colorado.* — Headwaters of Cedar, Lewis, Horsetail, and Pawnee Creeks in northeast Colorado. Fauna described by Cope in 1873 and later. The Lower, Middle, and Upper White River are represented. Cope's collections were from the lower and middle beds, Horizons *A* and *B* ; the fauna of Horizon *C* is determined from collections by the American Museum Expedition of 1898.

2. *Nebraska.* — Hat Creek Basin, adjoining the S. Dakota White River. Lower, Middle, and Upper White River are present.

3. *South Dakota.*—This is the largest and best known area. It lies between and about the White and Cheyenne Rivers, and furnishes the typical section. The Lower or Titanotherium Beds are divisible into three subzones, the Middle or Oreodon Beds into two subzones, and the Upper or Protoceras Beds probably into two subzones of which the uppermost one bears a generally scanty fauna.

4. *North Dakota.*—A small area near White Buttes contains a fauna apparently near to the Protoceras fauna in age.

5. *Montana.*—I have here included the lower beds of the Deep River valley, which Prof. Scott considers as Upper John Day. That they are later than the uppermost part of the White River (Horizon *C*, Leptauchenia Beds) is, I think, not proven, and they belong geographically to the White River.

6. *Canada.*—Swift Current Creek in the Cypress Hills, N. W. T. The area is limited and the rocks conglomeritic, so that the specimens were largely fragmentary. They are preserved in the Museum of the Geological Survey of Canada.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
MARSUPIALIA.													
Didelphys pygmæa Scott		×											P.
? **Didelphys** (Peratherium) **fugax** (Cope)		×											A. M.
? " " **huntii** (Cope)		×											"
? *Didelphys* (Peratherium) *alternans* (Cope)		×											"
? " " *scalaris* (Cope)		×											"
? " " *marginalis* (Cope)		×											"
RODENTIA.													
ISCHYROMYIDÆ.													
Ischyromys typus Leidy		×			×			×	×				Ph.
SCIURIDÆ.													
Sciurus relictus Cope		×											A. M.
Sciurus cf. *wortmani* Cope		×											
CASTORIDÆ.													
Steneofiber nebrascensis Leidy						×			×	×			Ph.
Steneofiber montanus Scott											×		P.
GEOMYIDÆ.													
Gymnoptychus minutus Cope		×											A. M.
Gymnoptychus trilophus Cope		×											"
Heliscomys vetus Cope		×											"

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.							Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.		Oreodon.		Protoceras.	N. Dakota.	Montana.	Canada.	
CRICETIDÆ.															
Eumys elegans Leidy		×			×				×	×					Ph.
LEPORIDÆ.															
Palæolagus haydeni Leidy		×	×		×				×	×					"
" **intermedius** sp. nov.[1]		×	×												A. M.
" **turgidus** Cope		×												×	"
Palæolagus triplex Cope		×													"
CREODONTA.															
HYÆNODONTIDÆ.															
Hyænodon horridus Leidy									×						
" **cruentus** Leidy		×								×					
" **crucians** Leidy		×							×	?					
Hyænodon leptocephalus Scott															H.
" *paucidens* O. & W.									×						A. M.
Hemipsalodon grandis Cope														×	C. G. S.
CARNIVORA.															
CANIDÆ.															
Daphænus (Amphicyon) vetus (Leidy)		×							×						U. S.
Daphænus (Amphicyon) hartshornianus (Cope)		×							×						A. M.
" *felinus*, Scott					×										P.
" *dodgei* Scott				×											P.

[1] A species intermediate in size between *P. haydeni* and *P. turgidus*. The size in these species appears to be fairly constant, and there may be other characters to separate this form.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
Cynodictis (*Canis*, *Galecynus*) **lippincottianus** Cope		×						× ×					A. M.
Amphicyon gracilis *Leidy* (nom. preoc.)								×					Ph.
" angustidens *Marsh*													Y.
Cynodictis (Galecynus) gregarius (Cope)		×						× ×		?			A.M.
? Cynodictis sp. maj			×						×				
Cynodesmus thöoides Scott													P.
PROCYONIDÆ.													A. M.
Phlaocyon leucosteus n. g. & sp.[1]			×										
MUSTELIDÆ.													"
Bunælurus lagophagus Cope		×											"
Canis osorum *Cope*		×											
FELIDÆ.													"
Dinictis felina Leidy							?	× ×	?				"
Dinictis squalidens Cope		×						?					
" *fortis* Adams							×	×					
Dinictis bombifrons *Adams*													K.
Dinictis paucidens Riggs													U. S.
Hoplophoneus (Drepanodon) primævus Leidy								×					Ph.
" " **occidentalis** Leidy								×					

[1] Generic characters: skull short and wide with thick, blunted low-cusped teeth; p^4 with postero-internal cusp. and strong, well separated antero-internal. Dentition $\frac{3.1.4.2}{3.1.4.3}$. Limbs and feet shorter than in *Cynodictis*, claws small and short. Apparently ancestral to the Procyonidæ. *P. leucosteus* is somewhat larger than *Cynodictis gregarius*. Length of skull 93.5 mm.; width 64.2; length of upper dentition 46.3; width across palate at posterior end of p^4, 34; length of tibia 84.5. The claws have a rudimentary basal sheath; the upper surfaces of the second phalanges are hollowed out as though the claws were slightly retractile.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
Dinotomius atrox *Williston*													K.
Hoplophoneus (*Machærodus*) *oreodontis* (Cope)		×											A. M.
Hoplophoneus robustus Adams		?			×			×					
" *insolens* Adams								×	×				
" *crassidens* Cragin													
Eusmilus dakotensis Hatcher									×				P.
INSECTIVORA.													
LEPTICTIDÆ.													
Leptictis haydeni Leidy													Ph.
Ictops dakotensis Leidy								×	×				"
Ictops bullatus sp. nov.[1]								×	×				A. M.
Mesodectes caniculus Cope [2]		×											"
INCERTÆ SEDIS.													
Geolabis rhynchæus Cope		×											"
Domnina [3] *gradata* Cope		×											"
" *crassigenis* Cope		×											"
Protosorex crassus Scott													[4]
PERISSODACTYLA.													
EQUIDÆ.													
Mesohippus [5] **(Anchitherium) bairdi** Leidy		×			×			×	×				

[1] Distinguished from type species by presence of small auditory bulla, m^3 reduced without metacone, longer skull and somewhat larger size.
[2] Validity of this genus somewhat doubtful. The only character separating it from *Ictops* is absence of trittocone on p^3, which is partly due to wear. The only character separating *Ictops* from *Leptictis* is absence of deuterocone and trittocone from p^3; they would otherwise be identical.
[3] Doubtfully separable from *Geolabis*. [4] Type in Mus. Chic. Univ. [5] *Vide* Farr, Am. Phil. Soc. Proc., 1896, 147.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
Anchitherium exoletum *Cope*		×											A. M.
" cuneatum *Cope*		×											"
Mesohippus intermedius O. & W.			?			×			×				"
" **copei** O. & W.								×	×				"
Mesohippus gracilis Marsh													Y.
" *celer* Marsh													"
" *westoni* (Cope)												×	C. G. S.
" (*Miohippus*) *? equiceps* (Cope.) [1]											×		
" " *? annectens* Marsh [1]											×		
Anchippus texanus Leidy [2]			?										? U. S.
Anchitherium agreste *Leidy*													"
LOPHIODONTIDÆ.													
Colodon (Lophiodon) occidentalis (Leidy)							×	×					Ph.
Colodon luxatus Marsh								×					Y.
" *dakotensis* O. & W.								×					A. M.
" *procuspidatus* O. & W.								×					"
? " (*Mesohippus*) *longipes* (O. & W)									×				"
TAPIRIDÆ.													
Protapirus simplex W. & E.								×					"
" **obliquidens** W. & E.									×				"
Protapirus validus Hatcher													P.

[1] Determination provisional, by Prof. Scott.

[2] See note (1) on p. 69.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.				N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.		Oreodon.	Protoceras.				
HYRACODONTIDÆ.														
Hyracodon (Rhinocerus) nebrascensis Leidy		×	?	?	×	?		?	×	×	?	?		U. S.
Hyracodon arcidens Cope		×												A. M.
Hyracodon major S. & O.														H.
Hyracodon planiceps S. & O.														"
AMYNODONTIDÆ.														
Metamynodon planifrons S. & O.									×					H.
RHINOCEROTIDÆ.														
Leptaceratherium trigonodum O. & W.								×						A. M.
Aceratherium mite Cope		×								×				A. M.
Cænopus pumilus *Cope*													×	C. G. S.
Aceratherium copei O. & W.								×						A. M.
" **occidentale** (Leidy)		×			×				×	×			×	U. S.
" **tridactylum** Osborn										×	×			A. M.
Diceratherium proavitum *Hatcher*						×								"
Aceratherium platycephalum O. & W.				×						×				U. P.
Aceratherium simplicidens (Cope)					×									A. M.
" *quadriplicatum* (Cope)		×												
TITANOTHERIIDÆ.														
Titanotherium[1] **(Teleodus) avum** Marsh							×							Y.
Titanotherium (*Megaceratops*) *coloradense* Leidy.[2]							×						×	Ph.

[1] For synonymy of species of *Titanotherium*, see Osborn, Bull. Am. Mus. Nat. Hist., 1896, pp. 174–196.

[2] Denver Basin.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
Titanotherium (Symborodon) **trigonoceras** Cope.	×						×						A. M
" (Brontotherium) **ingens** Marsh	×						×						Y.
Titanotherium (Symborodon) *heloceras* Cope	×						×						A. M.
" " *torvum* Cope	×						×						"
Titanotherium (Symborodon) **acre** Cope	×			×			×					×	"
Titanotherium (Diconodon) *montanum* Marsh							×						Y.
" (Haplacodon) *angustigenis* Cope												×	C. G. S.
" " *peltoceras* Cope							×						U. P.
Titanotherium (Brontops) **robustum** Marsh							×						Y.
Titanotherium (Menodus) *tichoceras* S. & O							×						H.
" " *dolichoceras* S. & O							×						"
Titanotherium (Titanops) **elatum** Marsh							×						Y.
Titanotherium (Titanops) *curtum* Marsh	×												"
Titanotherium (Menodus) **platyceras** S. & O							×						H.
Titanotherium ramosum Osborn							×						A. M.
" (Menodus) *selwynianum* Cope												×	C. G. S.
ANCYLOPODA.													
CHALICOTHERIIDÆ.													
Chalicotherium bilobatum Cope												×	"
ARTIODACTYLA.													
ANTHRACOTHERIIDÆ.													
Anthracotherium (Heptacodon) *curtum* (Marsh)													Y.
Anthracotherium occidentale *O. & W.*							×	×					A. M.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Proteceras.	Titanoth'm.	Oreodon.	Protoceras.				
Anthracotherium (Heptacodon) *gibbiceps* (Marsh)													Y.
" " *karense* O. & W.									×				A. M.
Octacodon valens *Marsh.*													Y.
Elomeryx (Heptacodon) armatus *Marsh*													"
Anthracotherium (Elomeryx) *mite* (Marsh)													"
Hyopotamus americanus Leidy								×					
" **brachyrhynchus** O. & W.									×				A. M.
Hyopotamus deflectus Marsh. S. Dakota.										?			Y.
ELOTHERIIDÆ.													
Elotherium mortoni Leidy	×				×		×	×					Ph.
" **crassum** Marsh	?	?						×	× ×				Y.
" **ingens** Leidy								×	× ×				
Elotherium robustum *Leidy*													? U. S.
Elotherium (Pelonax) *ramosum* Cope		×								×			A. M.
" *arctatum* Cope												×	C. G. S.
" (Ammodon) *bathrodon* Marsh													Y.
" " *potens* Marsh													"
" " *clavum* Marsh													"
INDET.													
Leptochœrus spectabilis Leidy.[1]								×	×				
Laopithecus robustus *Marsh*													Y.

[1] Marsh has described this genus as possessing artiodactyl feet. In the teeth it does not resemble any known Artiodactyl, and Marsh makes it the type of a new (undefined) family.

VII. White River.—*Continued.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
Leptochœrus (Menotherium) *lemurinus* (Cope)		×											A. M.
" *gracilis* Marsh		?						?					Y.
SUIDÆ.													
Thinohyus robustus Marsh									×				
" *nanus* Marsh								×					
Perchœrus probus Leidy								×					
" *antiquus* Marsh													
Nanohyus porcinus Leidy													
Bothrolabis (*Hyotherium*) *americanus* S. & O.													H.
" (*Palœochœrus*) *platyops* Cope									?				A. M.
OREODONTIDÆ.													
Agriochœrus antiquus Leidy							×	×					
" **latifrons** Leidy							×	×					
" **major** Leidy									×				
Agriochœrus (Agriomeryx) *migrans* Marsh									×				
Oreodon culbertsoni Leidy		×			×			×					
" **gracilis** Leidy		×			×	?		×	×				Ph.
" **bullatus** Leidy									×				"
Eporeodon major (Leidy)						×			×	×			
" **sp.**			×										
Mesoreodon chelonyx Scott			?								×		P.
Mesoreodon intermedius Scott											×		"
Merycochœrus sp.			×						?				

VII. White River.—*Concluded.*

	Colo.			Neb.			S. Dakota.			N. Dakota.	Montana.	Canada.	Type.
	Horizon A.	Horizon B.	Horizon C.	Titanoth'm.	Oreodon.	Protoceras.	Titanoth'm.	Oreodon.	Protoceras.				
Leptauchenia major Leidy									×				
" **decora** Leidy			×						×××				Ph.
Leptauchenia nitida Leidy									×				
CAMELIDÆ.													
Pöebrotherium wilsoni Leidy		?			×			×					Ph.
" **labiatum** Cope		×			×				×				A. M.
Pöebrotherium sp	×												"
Protomeryx halli Leidy			×						×		?		
Stibarus obtusilobus Cope		×											A. M.
TRAGULIDÆ.													
Leptomeryx evansi Leidy		×	?		×			×	×	?	×		×
Leptomeryx mammifer Cope		×											C. G. S.
" *semicinctus* Cope													"
" *esulcatus* Cope													"
Hypertragulus calcaratus Cope		×						×			×		A. M.
Hypertragulus tricostatus Cope		×											"
" *transversus* Cope													C. G. S.
Hypisodus minimus Cope		×											A. M.
PROTOCERATIDÆ.													
Protoceras celer Marsh									×				Y.
Protoceras comptus Marsh									×				"
" *nasutus* Marsh									×				"
Calops cristatus Marsh									×				"
" *consors* Marsh									×				"

VIII. *JOHN DAY.*

The level at which each species occurs is known only in a few cases, as noted.

RODENTIA.

SCIURIDÆ.

	Type.
Sciurus wortmani Cope	A. M.
Sciurus ballovianus Cope	"
Allomys nitens Marsh	Y.
" (Meniscomys) **hippodus** Cope	A. M.
Allomys (Meniscomys) *multiplicatus* Cope	"
" " *liolophus* Cope	"
" " *cavatus* Cope	"

CASTORIDÆ.

Steneofiber gradatus Cope	A. M.
" *peninsulatus* Cope	"

GEOMYIDÆ.

Pleurolicus sulcifrons Cope	A. M.
" *leptophrys* Cope	"
" *diplophysus* Cope	"
Entoptychus planifrons Cope	"
" **cavifrons** Cope	"
" **minor** Cope	"
Entoptychus lambdoideus Cope	"
" *crassiramis* Cope	"

MURIDÆ.

Hesperomys nematodon Cope	A. M.
Paciculus lockingtonianus Cope	"
Paciculus insolitus Cope	"

LEPORIDÆ.

Lepus ennisianus Cope[1]	A. M.

CARNIVORA.

CANIDÆ.

Paradaphænus[2] **(Amphicyon) cuspigerus** (Cope)	A. M.
Paradaphænus sp. indesc	"
Amphicyon hartshornianus *Cope* (part)	"
Nothocyon[2] **(Galecynus) geismarianus** (Cope)	"
" " **lemur** (Cope)	"
" " **latidens** (Cope)	"
Temnocyon altigenis Cope	"
Temnocyon wallovianus Cope	"
" *ferox* Evermann	P.

[1] Includes all specimens from John Day referred by Cope to *Palæolagus.*

[2] Unpublished.

VIII. John Day.—*Continued.*

	Type.
Hypotemnodon (Temnocyon) coryphæus (Cope)	A. M.
Hypotemnodon (Temnocyon) josephi (Cope)	"
Hyænocyon basilatus Cope	"
" *sectorius* Cope	"
Oligobunis crassivultus Cope	"
Enhydrocyon stenocephalus Cope	"

MUSTELIDÆ.

Parictis primævus Scott	P.

FELIDÆ.

Dinictis cyclops Cope	A. M.
Archælurus debilis Cope	"
Nimravus gomphodus Cope	"
Nimravus confertus Cope	"
Pogonodon platycopis Cope	"
Pogonodon brachyops Cope	"
Hoplophoneus cerebralis Cope	"
Hoplophoneus strigidens *Cope* (sp. indeterm.)	"

PERISSODACTYLA.

EQUIDÆ.

Mesohippus (Anchitherium) præstans (Cope)[1]	A. M.
" " **equiceps** (Cope)	"
" " *longicristis* (Cope)	"
" " *condoni* Leidy[2]	U. S.
" (*Miohippus*) *annectens* (Marsh)	Y.
" " *anceps* (Marsh)	"

LOPHIODONTIDÆ.

? *Colodon* (*Lophiodon*) *occidentalis* Leidy[2]	U. S.

RHINOCEROTIDÆ.

Aceratherium pacificum Leidy	U. S.
" ? *hesperium* Leidy	"
Aceratherium tubifer *Cope* (indet. sp.)	A. M.
Aceratherium truquianum Cope	"
" *annectens* Marsh	Y.
Diceratherium armatum Marsh	"
" **nanum** Marsh	"

INDETERMINATE.

Dæodon shoshonensis Cope	A. M.

? CHALICOTHERIIDÆ (aut EDENTATA).

Moropus distans Marsh	Y.
" *senex* Marsh	"

[1] Bridge Creek (Merycochœrus Beds).

[2] Bridge Creek.

VIII. John Day.—*Concluded.*

ARTIODACTYLA.

ELOTHERIIDÆ.

	Type.
Boöchœrus humerosus Cope[1]	A. M.
Elotherium imperator Leidy[2]	U. S.

SUIDÆ.

Bothrolabis (Dicotyles) pristinus Leidy[2]	U. S.
Bothrolabis trichœnus Cope	A. M.
" *rostratus* Cope	"
" *subæquans* Cope	
Chœnohyus decedens Cope	
Thinohyus lentus Marsh	Y.
" *socialis* Marsh	"

OREODONTIDÆ.

Agriochœrus trifrons Cope	A. M.
" **guyotianus** Cope	"
Agriochœrus ryderanus Cope	"
Agriochœrus (Coloreodon) *ferox* (Cope)	"
" " macrocephalus (Cope)	"
Eporeodon occidentalis Marsh	Y.
Eucrotaphus jacksoni *Leidy*, part	
" major *Leidy*, part	
Eporeodon occidentalis var. **leptacanthus** (Cope)[3]	A. M.
" " var. **pacificus** (Cope)[3]	"
Eporeodon trigonocephalus (Cope)	"
" *socialis* Marsh	Y.
" *major* var. *longifrons* (Cope)[3]	A. M.
Merycochœrus (Oreodon) superbus Leidy[4]	U. S.
" **chelydra** Cope[4]	A. M.
Merycochœrus leidyi Bettany[4]	
" *macrostegus* Cope[4]	A. M.

CAMELIDÆ.

Protomeryx (Gomphotherium) **sternbergi** Cope	A. M.
" " **cameloides** Wortman[4]	"
Hypertragulus calcaratus Cope	"

[1] Perhaps the same as *Elotherium imperator* Leidy.
[2] Bridge Creek.
[3] These may probably be distinct species.
[4] Bridge Creek Beds.

IX. *LOUP FORK.*

The localities tabulated below are as follows:

1. *Northeastern Colorado.* Headwaters of Cedar, Horsetail, and Pawnee Creeks, in Logan and Weld counties, north of the South Platte River. Sands and gravels overlying the White River clays, usually unconformably with heavy conglomerates at or near the base. Another unconformity of erosion occurs sometimes within the formation dividing it into horizons D and E (p. 23); but no important faunal distinctions appear. These unconformities of erosion in fluviatile beds are not of much importance. Collections made by Prof. Cope in 1873 and 1879, and Amer. Mus. Exped. of 1898.

2. *Laramie Peak, Wyoming.* A small collection chiefly of *Merychyus*, made for Prof. Cope in 1880.

3. *Deep River, Montana.* A limited area in the valley of Deep Creek or Smith River, near Great Falls. Collections made for Prof. Cope in 1877, and Princeton Expedition of 1892.

4. *Cottonwood, Oregon.* Cottonwood Creek in the valley of the John Day River. Collection made for Prof. Cope in 1879 by Dr. J. L. Wortman.

5. *Oregon Desert.* See foot-note, p. 70.

6. *Nebraska.* In the basins of the Loup River (Loup Fork) and Niobrara River, and elsewhere in the central and northern part of western Nebraska. The fauna, described mainly by Leidy and Marsh, is the typical and largest Loup Fork fauna.

7. *New Mexico.* This fauna was described by Cope in 1874 from the collections made by the Wheeler Survey, and now preserved in the National Museum. Most of the species came from the Santa Fé basin.

8. *Kansas–Nebraska.* Northwestern Kansas and southwestern Nebraska in the drainage basin of the Republican River. The latest of the Loup Fork faunas, some of it Pliocene according to Prof. Scott. The short-legged Rhinoceroses are the most abundant fossil.

9. *Texas.* In northern Texas, near the head of the Red River, along the northeastern border of the Llano Estacado.

IX. *LOUP FORK.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
RODENTIA.										
SCIURIDÆ.										
Arctomys vetus Marsh						×				
Cynomys sp.								×		
MYLAGAULIDÆ.										
Mylagaulus sesquipedalis Cope								××		A. M.
Mylagaulus monodon Cope[1]	×							××		"
CASTORIDÆ.										
Steneofiber pansus Cope							×			U. S.
" sp.								×		
Eucastor tortus Leidy						×				
Sigmogomphius lecontei Merriam ..... Pliocene, California.										
GEOMYIDÆ.										
Geomys bisulcatus Marsh[2]						×				Y.
Hesperomys loxodon Cope							×			U. S.
" sp.								×		

[1] A skull and jaws of this species, collected in Colorado in 1898, show that Cope was justified in placing it in a separate family. It is partly intermediate between *Castoridæ* and *Sciuridæ*, but has many peculiar characters.

[2] Also from Blue Creek; identification uncertain; associated with *Cyclopidius*.

IX. Loup Fork.—*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
LEPORIDÆ.										
Panolax sanctæfidei Cope							×			U. S.
Lepus sp.								×		
CARNIVORA.										
CANIDÆ.										
Ælurodon compressus Cope						×				A. M.
Ælurodon sævus Leidy						×	×	×		U. S.
" **haydeni** Leidy										"
" **wheelerianus** Cope						×	×			"
" **hyænoides** Cope								×		A. M.
Ælurodon taxoides Hatcher								×		P.
" *mæandrinus* Hatcher								×		"
" *ursinus* Cope						×	×			U. S.
? *Canis montanus* Marsh										Y.
" *vafer* Leidy						×				U. S.
" *temerarius* Leidy	×					×				"
" *brachypus* Cope		×								A. M.
" *anceps* Scott			×							P.
PROCYONIDÆ.										
Leptarctus primus Leidy						×				

IX. LOUP FORK.—*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas–Nebraska.	Texas.	Type.
MUSTELIDÆ.										
Mustela parviloba (Martes mustelinus *Cope*)	×					×				A. M.
" sp	×									"
Putorius nambianus Cope							×			U. S.
? *Stenogale robusta* Cope						××				A. M.
Brachypsalis pachygnathus Cope						××				"
Lutrictis lycopotamicus Cope				×						"
Tomarctus brevirostris Cope	×									"
FELIDÆ.										
Pseudælurus intrepidus Leidy	×					×				U. S.
Machærodus catocopis Cope						×		××		A. M.
? *Felis maxima* S. & O. (= *Machærodus*, fide Adams)								××		H.
? " *augustus* Leidy						×		××		U. S.
PROBOSCIDEA.										
ELEPHANTIDÆ.										
Tetrabelodon angustidens (Cuvier)							×	×		
" *brevidens* Cope	?		×							A. M.
" *serridens* Cope									×	
" *productus* Cope							×			U. S.
" *euhypodon* Cope								××		A. M.
" *campester* Cope								××		"

IX. Loup Fork.—*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
Dibelodon mirificus Leidy						×			×	
" *præcursor* Cope										
PERISSODACTYLA.										
EQUIDÆ.										
Mesohippus (*Miohippus*) sp.			×							
" (*Anchitherium*) *ultimus* Cope			×	×						A. M.
Anchitherium equinum Scott	?		×	×						P.
Anchippus texanus Leidy	×		×						[1] ×	
Anchitherium australe *Leidy*									[1] ×	
Anchippus (*Desmatippus*) *crenidens* (Scott)			×							P.
Anchippus brevidens Marsh				×						Y.
Protohippus[2] **perditus** Leidy	×	×				×		×	×	U. S.
Protohippus profectus *Cope*								×		
? " labrosus *Cope*	×									A. M.
Parahippus cognatus *Leidy*										
Protohippus placidus Leidy						×		×	×	
Hipparion gratus *Leidy*										
Protohippus (Equus) parvulus *Marsh*										
Protohippus medius Cope				×		×		×		
? Merychippus insignis *Leidy* (Indet. sp.)										
Protohippus sejunctus Cope	×		×			? ×	? ×			A. M.

[1] Type from Washington Co., "Miocene." May be White River.

[2] Strictly speaking, *Protohippus* is preoccupied by *Merychippus*, the type of which is generically though perhaps not specifically determinable. Cope (Tex. Geol. Sur., 1892) has stated the reasons for preferring the name *Protohippus*.

IX. Loup Fork—*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
Protohippus castilli Cope [1]										A. M.
" *avus* Marsh				?						Y.
Pliohippus pernix Marsh						×				"
" *robustus* Marsh						×				"
Pliohippus (Merychippus) mirabilis (Leidy) [2]	×					×			×	
Protohippus supremus *Leidy*										
Pliohippus (*Protohippus*) *pachyops* (Cope)								?	×	T.
" " *fossulatus* (Cope)								×		"
" (*Hippidium*) *spectans* (Cope)				×						A. M.
Hipparion (Hippotherium) isonesum (Cope)	×		×	×						"
" **speciosum** (Leidy)						×		×		
" **occidentale** (Leidy)				× [3]						
Hipparion sinclairii (Wortman)				× [3]						A. M.
" *montezumæ* (Leidy) [4]										
" *peninsulatum* (Cope) [5]										A. M.
" *paniense* (Cope)	×									"
" *calamarium* (Cope)	×						×			

[1] Type from Tehuichila, Vera Cruz, Mexico.

[2] It is probable that a more complete knowledge of the one-toed Horses of the Loup Fork would show them to be generically distinct from *Hippidion*. In this case Marsh's name *Pliohippus* can properly be used. They are much smaller, very much slenderer than *Hippidion;* the skulls are like *Protohippus* as far as known, and the nasals are probably as in that genus and very different from *Hippidion*. *Protohippus mirabilis* Leidy may, according to Cope, belong in this genus, a suggestion confirmed by a skeleton found recently in Colorado. *P. pachyops* and *P. fossulatus* are very similar. All are distinguished from *Protohippus* by large size, unusually large cement lakes, and very little complication of the enamel.

[3] From the loose gravels overlying the Cottonwood beds. [4] Mexico. [5] Tehuichila, Vera Cruz, Mexico.

IX. Loup Fork —*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
Hipparion relictum Cope[1]					×					A. M.
H. severum, H. sphenodus *Cope* (sp. indeterm.)	×									"
TAPIRIDÆ.										
Tapiravus rarus Marsh[2]										Y.
RHINOCEROTIDÆ.										
Ceratherium profectum n. sp.[3]	×									A. M.
" **(Aphelops) megalodum** (Cope)[4]	×		?							"
? Rhinoceros crassus *Leidy*										U. S.
Teleoceras fossiger (Cope)								×		A. M.
Teleoceras major *Hatcher*								××		P.
Aceratherium acutum *Marsh*								×		Y.
? Teleoceras malacorhinus (Cope)										A. M.
? Rhinoceros meridianus *Leidy*										
Teleoceras superciliosus (Cope)								×		A. M.
Aceratherium (*Aphelops*) *jemezanum* (Cope)							×			U. S.
" (*Rhinoceros*) *oregonensis* (Marsh)[5]				?						Y.

[1] Teeth found in the Oregon Desert, along with bones of *Aphelops* (cf. *fossiger*), undetermined Proboscidea and a large Camel, in size equal to *Procamelus robustus* Leidy. Prof Cope referred these specimens to the Pliocene (= Blanco), but they do not seem separable from the Kansas Loup Fork fauna.

[2] "Lower Pliocene, east of the Rocky Mountains."

[3] Dentition and proportions of teeth as in *A. occidentale*. Jaw shorter, deeper, and more rounded than *A. occidentale*, angle as in *A. megalodus*.

[4] In the synonymy of the Loup Fork Rhinoceroses, I have followed Prof. Osborn's provisional use of Cope's specific names based on complete skulls, etc., rather than Leidy's earlier names based on fragmentary specimens.

[5] "Pliocene . . . . about two thirds the size of *R. crassus* Leidy."

IX. Loup Fork.—*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
? CHALICOTHERIIDÆ aut EDENTATA.										
Moropus elatus Marsh[1]	?					×				Y.
ARTIODACTYLA.										
SUIDÆ.										
Dicotyles serus Cope								×		A. M.
Platygonus striatus Marsh										
SUINÆ INDET.										
OREODONTIDÆ.										
Merycochœrus rusticus Leidy—Wyoming.										U. S.
" *proprius* Leidy	?					×				"
" *cenopus* S. & O						×				H.
" *montanus* Cope			×							A. M.
" *obliquidens* Cope				××						"
" sp				×						
Merychyus elegans Leidy	?					××				U. S.
" **medius** Leidy	××					×××	×			"
" **major** Leidy	×					×				"

[1] Prof. Marsh (A. J. S., May, 1892, p. 448, foot-note) states that *Moropus* is distinct from *Chalicotherium*, with which it was identified by Scott and Osborn, but gives no reasons for the separation. The Colorado specimen indicated above has metatarsals and toes closely resembling *Ancylotherium*, and should be renamed if *Moropus* is edentate; the reference is only provisional. An undoubted chalicothere from Nebraska was referred by Scott and Osborn to Marsh's species.

IX. Loup Fork.—*Continued.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
Merychyus zygomaticus (Cope)			××							A. M.
" *pariogonus* (Cope)			××							"
" *arenarum* (Cope)		××								"
" *euryops* (Cope)		××								"
Cyclopidius emydinus Cope			×			1				"
" **simus** Cope			×××							"
Pithecistes brevifacies *Cope*[2]			×××							"
Cyclopidius incisivus Scott			×××							P.
Cyclopidius (Pithecistes) **decedens** (Cope)			×××			1				A. M.
? Pithecistes heterodon *Cope*			×							"
CAMELIDÆ.										
Procamelus robustus Leidy					?	×	×	××	×	U. S.
Protolabis prehensilis *Cope*								×		A. M.
Procamelus altus *Marsh*						×				Y.
Procamelus occidentalis Leidy						××	×	×	×	U. S.
Homocamelus caninus *Leidy*						××				"
Procamelus gracilis Leidy						×	×	×	××	"
Procamelus leptognathus Cope									×	T.

[1] Blue Creek, Cheyenne Co., associated with *Merychyus* and ? *Merycochœrus*.

[2] *Pithecistes* was distinguished by Cope from *Cyclopidius* by: (1) lower incisors reduced to one on each side; (2) canine not incisiform; (3) $p_{\bar{1}}$, absent. These characters are shown only in the single known specimen of the type species *P. brevifacies*, a very old individual. Careful comparison and more complete removal of the matrix show that: (1) the alveoli of two small incisors are present on each side; (2) the canine, mistaken by Cope for an incisor, is present and worn to a stump; (3), the first pre-molar, mistaken for canine by Cope, is present and caniniform; (4) there are no distinctions whatsoever from *Cyclopidius simus* except those due to age of the individual. *Pithecistes decedens* is the permanent and *P. heterodon* probably the milk dentition of a smaller species of *Cyclopidius;* both are founded on upper teeth.

IX. Loup Fork.—*Concluded.*

	N. E. Colorado.	Laramie P'k, Wyo.	Deep River, Mont.	Cottonwood, Ore.	Oregon Desert.	Nebraska.	New Mexico.	Kansas-Nebraska.	Texas.	Type.
Protolabis heterodontus Cope[1]	×									A. M.
" **(Procamelus) ? angustidens** Cope	××		?							"
Miolabis (Procamelus) ? fissidens Cope	×									"
" **(Protolabis) ? transmontanus** Cope				×						"
" sp	×									"
Pliauchenia humphresiana Cope							××	×		U. S.
Pliauchenia vulcanorum *Cope*							××			"
Pliauchenia minima Wortman								×		A. M.
CERVIDÆ.										
Blastomeryx gemmifer Cope	×					×	×			A. M.
" **borealis** Cope	?		××	×		×	×			"
Blastomeryx antelopinus Scott			×							P.
Cosoryx furcatus Leidy						×	×	×		
Cosoryx ramosus *Cope*										
Cosoryx necatus Leidy						××		×		A. M.
Cervus warreni *Leidy*						×				U. S.
Cosoryx teres Cope								××		"
" *trilateralis* Cope										"
" *tehuanus* Cope								×		"
BOVIDÆ.										
Bison ferox Marsh[2]						×				Y.
" *alleni* Marsh[2]								×		"

[1] Additional and more complete material from Colorado shows that the Camels of that region are not *Procamelus*, but belong to two distinct genera. For one of these *Protolabis* Cope can probably be used; the other, if distinct from *Protomeryx*, may be called *Miolabis*, a name suggested by Dr. O. P. Hay in a recent letter to Prof. Osborn. The genera will be more fully defined in a forthcoming article on the Colorado Miocene. At present the distinctions appear to be: *Procamelus*. Dentition $I\frac{1}{3}$, $C\frac{1}{1}$, $P\frac{4}{4}$, $M\frac{3}{3}$; metapodials united. *Protolabis*. Dentition $I\frac{3-1}{3}$, $C\frac{1}{1}$, $P\frac{4}{4}$, $M\frac{3}{3}$; metapodials united; neck and legs greatly elongated, as in the Giraffe. *Miolabis*. Dentition $I\frac{3}{3}$, $C\frac{1}{1}$, $P\frac{4}{4-3}$, $M\frac{3}{3}$; metapodials separate.

[2] "Lower Pliocene."

X. *PLIOCENE.*

A. Palo Duro.

(GOODNIGHT BEDS.)

This fauna, except for the presence of *Equus*, corresponds with the later Loup Fork fauna, which may also be Pliocene according to Prof. Scott. It is too scanty for certain correlation. The formation overlies the Texas Loup Fork unconformably.[1]

PERISSODACTYLA.

RHINOCEROTIDÆ.

Aphelops sp.....

EQUIDÆ.

Protohippus lenticularis Cope..... T.
" *perditus* Leidy.....
" sp.....
Pliohippus (*Hippidium*) *interpolatus* (Cope)..... T.
" " *spectans* (Cope).....
Equus eurystylus Cope..... T.
" ? *simplicidens* Cope.....

B. Blanco.

CARNIVORA.

CANIDÆ.

Canimartes cumminsii Cope..... T.
Borophagus diversidens Cope..... "
Felis hillanus Cope..... "

EDENTATA.

Megalonyx leptostomus Cope..... T.

PROBOSCIDEA.

Dibelodon humboldtii (Cuvier).....
" *tropicus*.....
" *præcursor* Cope..... T.
Tetrabelodon shepardii (Leidy)[2].....

PERISSODACTYLA.

EQUIDÆ.

Equus simplicidens Cope..... T.
" *cumminsii* Cope..... "
" *minutus* Cope..... "

ARTIODACTYLA.

SUIDÆ.

Platygonus bicalcaratus Cope..... T.

CAMELIDÆ.

Pliauchenia spatula Cope..... T.

[1] Texas Geol. Sur. Rep., 1892.
[2] One specimen in American Museum of Natural History.

Article IV.—DESCRIPTIONS OF THREE NEW SQUIRRELS FROM SOUTH AMERICA.

By E. W. Nelson.

Recent study shows that tropical North America has a wonderful variety of Tree Squirrels, and when Northern South America has been more thoroughly explored, it will doubtless prove to be equally rich in these interesting mammals. Through the courtesy of Mr. F. W. True, Executive Curator, U. S. National Museum, and Dr. J. A. Allen, Curator of Mammals in the American Museum of Natural History, New York, the series of tropical American squirrels from the collections in their charge were recently placed in my hands for examination. Among the specimens from South America are three which appear to be undescribed. One of these, *S. isthmius*, a very distinct species of *Microsciurus*, is represented by two specimens taken many years ago during explorations on the Isthmus of Darien by Lieut. Michler, U. S. A. The other two, *S. similis* and *S. caucensis*, are from a collection recently obtained by the American Museum from the upper Cauca River, Colombia, and I am especially indebted to Dr. Allen for the privilege of describing them. *S. caucensis* is very interesting on account of its close external resemblance to *Microsciurus*, while in reality, as shown by its skull, it belongs to the subgenus *Guerlinguetus*. All measurements in this paper are in millimetres.

Sciurus (Microsciurus) isthmius, sp. nov.

Darien Squirrel.

Type, No. $\frac{3399}{37344}$ U. S. National Museum. Collected on the Truando River, Colombia, by. A. Schott.

Distribution.—Humid tropical forests of Truando River.[1] Known only from the type locality.

Specific characters.—Size about the same as *S. alfari*, but color very different. Upper parts yellowish brown; neck and breast dark rufous; abdomen dark reddish brown. Ears short, rounded, well haired, more yellowish than back. Tail rounded. Pelage thin and dorsal hairs comparatively coarse.

[1] The Truando River is a tributary on the west side of the Rio Atrato at the extreme southeast end of the Isthmus of Darien, Colombia.

Color.—Entire upperparts, including feet, uniform grizzled, dark yellowish brown; ears yellowish brown, much paler than crown; sides of nose and chin dingy brown with suffusion of dull rufous; under side of neck and breast dingy ferruginous, shading posteriorly into dark reddish brown lightly washed with rufous; tail above grizzled rusty brown and black, hairs indistinctly tipped with pale yellowish; tail below similar but median area more rusty rufous; hairs on back black with broad subterminal rings of yellowish brown.

Variation.—A topotype of this species (No. 3403 U. S. Nat. Museum) is like the type except that the crown is thinly washed with blackish, and the underparts are brighter ferruginous with a heavier wash of this color over the abdomen.

Measurements of type, from dried skin.—Length of body, 150; tail, imperfect; hind foot, 37.

Cranial characters.—Premolars $\frac{2}{1}$. Skull (See Fig. 1), including rostrum, decidedly broader and more massive than in either *S. alfari* or *S. peruanus;* the vertical part of jugal narrower than in *alfari* but broader than in *peruanus*, and

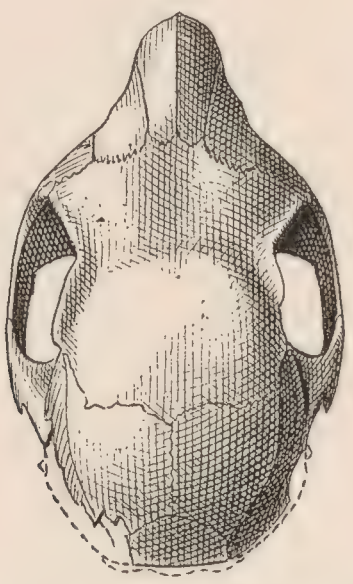

FIG. 1. *Sciurus isthmius.* Natural size, type, No. $\frac{3399}{37344}$, U. S. Nat. Mus.

the upper molar series the same length as in the last named species; the nasals more rounded posteriorly and the lower jaw more massive than in either of the two species named. The skull of the type measures: Palatal length, 15; interorbital breadth, 16; length of upper molar series, 6.5.

Specimens examined.—Two; both from type locality.

General Notes.—Unfortunately the tails are imperfect on both of the known specimens of this squirrel. The broad skull and comparatively coarse pelage of upperparts serve to readily distinguish this species from *S. alfari*, *S. peruanus*, and *S. similis.*

Sciurus (Microsciurus) similis, sp. nov.

RUFOUS-BREASTED SQUIRREL.

Type, No. 14210, ♂ ad., American Museum of Natural History, N. Y. Collected near Cali, Cauca Valley, Colombia (alt. 6000 ft.), November 8, 1898, by J. H. Batty.

Distribution.—Known only from the type locality.

Specific characters.—In size and color of upperparts similar to *S. alfari*, but under side of neck, breast, and inside of fore legs deep ferruginous, and rest of underparts dark brown thinly washed with rufous. Ears short, rounded, thickly haired. Tail narrow and rounded. Pelage thick and soft.

Color.—Entire upperparts dark brown finely grizzled with dull rusty; top of nose, sides of head, neck, outside of fore legs and all of feet more yellowish than back; no ring around eyes; ears like adjacent parts of head; chin dingy rusty; throat, breast, and inside of fore legs deep ferruginous; rest of underparts dingy brown, with a thin wash of dull rufous; tail above black, thinly washed with dark rufous, with dark rufous basal color showing through; tail below, median area grizzled dark rusty rufous with indistinct border of black and very thin edge of rufous. Hairs on back black with narrow subterminal and sometimes median rings of dark buffy mixed with hairs entirely black.

Measurements of type, from dried skin.—Total length, 245; tail vertebræ, 98; hind foot, 34.

Cranial characters.—*S. similis* undoubtedly has two upper premolars like other species of *Microsciurus*, but unfortunately the type is without a skull as, by some error, the skull sent in with the type skin by the collector belongs to the much larger and very different species *S. caucensis*.

Specimens examined.—One; from the type locality.

General Notes.—*Sciurus similis* in size and general appearance resembles *S. alfari*, from which it may be readily distinguished by the dark ferruginous chest and dark brown abdomen. The head is not brighter ferruginous than the back, and there is no ring around eyes.

Sciurus (Guerlinguetus) caucensis, sp. nov.

Cauca Valley Squirrel.

Type, No. 14208, ♂ ad., American Museum of Natural History, N. Y. Collected on the Lima River, upper Cauca Valley, Colombia (alt. 6000 feet), August 10, 1898, by J. H. Batty.

Distribution.—Known only from the type locality.

Specific characters.—About half the size of *S. æstuans hoffmanni*. Upperparts dark brown finely grizzled with rusty; underparts reddish buffy, most intense on neck and breast and paler elsewhere. Ears short, rounded, thickly haired. Tail slender, rather flattened, thinly washed with white. Pelage thick and soft.

Color.—Upperparts finely grizzled, dark rusty brown with a narrow blackish brown dorsal line beginning on crown; eyes with a narrow ring of rusty buffy; ears like top of head; cheeks paler, more grayish brown; top of nose, sides of neck, outside of fore legs, with fore and hind feet, more rusty red than back, lower edge of flanks and outside of hind legs more thinly washed with same;

chin dingy fulvous; throat and middle of chest reddish buffy, becoming paler posteriorly over middle of belly and inside of thighs; inside of fore legs and sides of belly dingy grayish brown with a thin wash of pale buffy; tail above black with a thin wash of grayish white; lower surface grizzled dark dingy rusty with poorly defined black border and thin grayish white edge. Hairs on back black with dark rusty subterminal rings mixed with hairs entirely black.

Variation.—The two specimens examined are almost identical in color, the only difference being the slightly greater intensity of the buffy and rufous shades in the type.

Measurements.—Average of two specimens from type locality; Total length, 312; tail vertebræ, 145.5; hind foot, 42.5.

Cranial characters: Premolars $\frac{1}{1}$. The skull is almost precisely intermediate in general shape between that of *S. hoffmanni*, representing the subgenus *Guerlinguetus*, and that of *S. alfari*, representing the subgenus *Microsciurus*, but the absence of the extra premolar leads me to place it in the former group. The skull of the type measures: Basal length, 34; palatal length, 17; interorbital breadth, 14; length of upper molar series, 7.

Specimens examined.—Two; both from type locality.

General Notes.—In the style of coloration and the rather short and hairy ears, *S. caucensis* shows much similarity to the species of *Microsciurus*, but the absence of the first upper premolar, and the more depressed, slenderer skull, show that it really belongs to the subgenus *Guerlinguetus*.

Article V. — DESCRIPTION OF AN ANCIENT ANOMALOUS SKELETON FROM THE VALLEY OF MEXICO; WITH SPECIAL REFERENCE TO SUPERNUMERARY AND BICIPITAL RIBS IN MAN.[1]

By Dr. Aleš Hrdlička.

The skeleton described in this paper was exhumed at the adobe-works at St. Simon Tonaguac, a small suburb of the City of Mexico. The same place has yielded from time to time human bones and various objects of archæological interest. The bones were procured directly from the workmen by Dr. Carl Lumholtz during his explorations for the American Museum of Natural History, and are now in the Anthropological Department of the Museum (Catalogue No. $\frac{99}{252}$).

The skeleton was discovered about three metres below the surface. The workmen were unable to give definite information regarding the surroundings of the bones. The importance of the skeleton induced me to make, on my recent visit to Mexico,[2] a special examination of the adobe-works about St. Simon.

St. Simon lies about a mile and a half northeast from the City of Mexico, to the left of the road which leads to Guadalupe. Most of the inhabitants of this little town, as well as those of several small settlements adjoining, are occupied with adobe-making. The grounds of St. Simon are part of the lowlands which extend from the City of Mexico to the Lake of Texcoco. In places the ground rises slightly over the level of the lowlands, and here most of the excavating is done.

The adobe deposit consists of a rather compact dark gray earth. Originally it was probably marsh land, which has been covered with material derived from successive inundations. Mixed with this is the accumulated refuse from habitations, which contains many fragments of pottery, pieces of obsidian, and bones of animals.

The particular place from which the skeleton came is at a rise

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[1] Read in a preliminary form before the American Association for the Advancement of Science, August 13, 1897.

[2] Lumholtz-Hrdlička Expedition, under the auspices of the American Museum of Natural History, New York, March-July, 1898.

of about two metres above the level land, and is about seventy metres in its greatest length. Its characteristics are identical with those of the other adobe-works of St. Simon. I could distinguish no regular stratification in the earth of this place, nor any difference in its composition at different heights. The deeper parts look darker and even black ; but this is due to difference in moisture. About four metres below the highest point of the surface, water is met toward the end of the dry season. This prevents further digging downward.

Throughout the deposit, but particularly in its upper third, numerous layers of fragments of pottery are found. These layers do not form continuous strata, and when exposed from the top look like larger or smaller irregular heaps of fragments. In all probability they represent dumps of refuse. Down to two metres and a half from the top, I found individual animal bones in these layers of potsherds, or in the earth between them. Below this the deposit is less productive of remains of all kinds, and the fragments of pottery are much more scattered. At a depth of three metres and below, numerous human skeletons are met with, and occasionally stone beads, terracotta, and stone figures are found. The skeletons lie singly. The archæological objects belong apparently to the Aztec culture.

The anomalous skeleton comes from this lower portion. During my stay in the City of Mexico, I obtained about fifteen additional skulls and skeletons from the same place and depth. Among these skulls or skeletons, so far as I can say from a preliminary examination, there is not one that approaches in inferior characteristics the specimen here described.

I gave a certain amount of attention to the fragments of pottery found at different horizons in the adobe deposits of St. Simon. My observations, which are not those of a trained archæologist, may be summed up as follows. In no portion of the deposit, to the depth of four metres, do fragments of any one kind of pottery predominate to the complete exclusion of other kinds. Many of the fragments found, from the surface down to a depth of 1.5 metres, are of very smooth, polished ware of a bright red color. Numerous other fragments from this same part show various drawings in colors, and still other fragments have stamped or incised designs. At the same time, there are frequently found,

among these fragments of high-grade pottery, pieces of very rude earthen vessels, thick, rough, and without any decoration whatever; also crude potsherds showing impression of network with which they were surrounded. Lower down, the higher grades of fragments become rare and the crude fragments more frequent. I myself dug out, however, a fragment of the red, highly polished pottery from over two metres below the surface; and at a depth of from three to four metres I took out half of a fine Aztec tumbler, and saw an entire one dug from the same layer. These, however, may have been buried there.

Obsidian fragments are met with throughout the whole deposit. They consist generally of crude fragments or pieces; but occasionally parts of knives or chisels, or nuclei, are also found. Among the hundreds of obsidian fragments which I examined, I did not find an arrow or a spear point; nor have the brickmakers whom I questioned on this point met with any.[1] From my observations on this particular adobe-field, I reach the following conclusions: —

The field is an old, gradual accumulation of aqueous origin, augmented by irregular heaps of refuse consisting mainly of fragments of pottery. The upper half, or a little more, of the deposit, corresponds to the period in which the best kind of Aztec pottery was made. The lower parts show a predominance of crude forms of earthenware, some of which may be of a pre-Aztec origin.

About three metres from the surface of the mound begins what in all probability is a prehistoric burial-place. Judging from the pottery, figures, and ornaments buried here, and from the nature of the majority of the skulls recovered, this burial-place has been at least partly utilized by the Aztecs.

The skeleton here described, as already stated, lay deep in the ground. It could not be ascertained if any ancient manufactured objects were found in its immediate vicinity. Other skulls from the same locality were secured at the same time by Dr. Lumholtz. About half of these agree in appearance, to a certain extent, with the skull of the skeleton in question; while the other portion differs. Several of this latter class show signs of incineration.

[1] Some of the important adobe-fields around the City of Mexico have received the attention of Professor William H. Holmes of the National Museum in Washington. His two notes on these deposits are published in the Transactions of the Anthropological Society of Washington, 1885, pp. 69, 70, and in Ancient Cities of Mexico, 1897, p. 299.

Most of the skulls I obtained from the same locality also agree in appearance, to a certain extent, with the skull of this skeleton. But, as already mentioned, there is not one among the skulls or skeletons from this locality, and now in the possession of the Museum, which approaches this specimen in inferior characteristics. All the parts of the skeleton, and most of the other bones from the same place, are fairly well preserved. The bones contain but little organic matter.

The skeleton is not complete. Three of the vertebræ (sixth cervical, last dorsal, and first lumbar), both ulnæ, several teeth, and most of the small bones of the hands and feet, are missing. Not one of the parts present shows any pathological changes.

The general characteristics of the bones of the specimen, taken together, indicate that we have to deal with the skeleton of an adult though not very aged man of moderate muscular development and of rather small stature.

The skull is of small size, and somewhat deformed. The deformity is of the kind which Topinard terms 'simple occipital.' It consists, in this case, of a flattening, slightly greater on the right, of that part of the occiput which is situated between the external occipital protuberance or inion, and the parietal foramina or obelion. The same deformation may be seen in a few other male skulls from the same locality. I have also occasionally found the same type among skulls of prehistoric peoples of other parts of Mexico. It is the type of deformation of the old mound-builders, pueblos, and cliff-dwellers, but not carried to the extreme. Waitz mentions,[1] that, in many of the Indian tribes, the flat-backed heads were produced artificially by means of a special form of the infant's cradle, or of what served in place of it.

In size the skull does not reach that of an average male adult of the white race. The thickness of its parietal bones below the parietal bosses ranges from 3.5 mm. to 4.5 mm., — a proportion common in the whites.[2]

The forehead is well arched, and fairly high and broad, having a minimum frontal diameter of 9 cm. Its aspect, however, has been affected by the occipital compression. The sagittal region

[1] Anthropologie der Natur-Völker, IV, p. 62.

[2] The subject, calculating his height from the long bones by Manouvrière's Tables, measured about 1.6 metres.

is high, oval from side to side, and presents no marked ridges or depressions. The parietals are full, and the right side shorter than the left. The temporal regions are about as concave as in an ordinary white mesocephalic skull. The temporal ridge is from 5 mm. to 8 mm. broad, and well marked; approach of its upper edge to the bregma, along the coronal suture, is 7.1 cm.; the closest approach of its upper edge to the sagittal suture is about 4.5 cm. Both these distances are smaller than in the average white.[1] The occipital region is compressed. The occipital ridges and depressions are rather feeble, the crest being low and not very distinct. The mastoids are strong and of a good size, though not excessive. The supramastoid elevations are about medium.

Of the facial parts the supra-orbital ridges are about as large as those in an average adult male white, or perhaps slightly larger. The glabella is convex and full. The malars are prominent, but not of excessive strength or size. They show no trace of any division. The zygomæ are moderately massive, the maximum bizygomatic diameter being 12.8 cm. This is low in comparison with measurements of Mexican Indians from other localities. The canine fossæ are of medium depth. The nasal-root depression is small; the nasal bridge, low and concave; and the nasal bones, narrow. The nasal aperture is pyriform, and not very large. The nasal spine is quite strong and of medium height, being .9 cm. long. The nasal notches are well defined, the left slightly lower. There are no *gouttières simiennes* (subnasal depressions). On both sides of the face the lachrymal bone enters into the formation of the lower border of the orbit; on the right side it descends externally more than 2 mm. below it. A suture runs from each of the infra-orbital foramina to the edge of the orbit, and along the floor of this to the posterior opening of the infra-orbital canal.

The dental arches are strong, though not massive. The upper arch is somewhat irregular externally and on the right. This irregularity consists of a greater depression over the incisors, and a somewhat greater elevation over and behind the canine, and is due to a vicious disposition of the dental sockets, to which I shall

[1] In a series of examinations of the skulls of whites, I found the distance of the upper border of the temporal ridges to range from 5 cm. to 7 cm., with an average of about 6.3 cm.

refer later. There is a certain amount of prognathism of the upper dental arch, but the face as a whole is orthognathous. (Plate I.) The lower jaw is of a peculiar shape, and is shown in Plate II, Fig. 1. I have found no other under-jaw of this type among the Mexicans. The bone is not very heavy, and is rather short. The angles are somewhat divergent, quite prominent, and externally irregular, which will be better seen in the front view

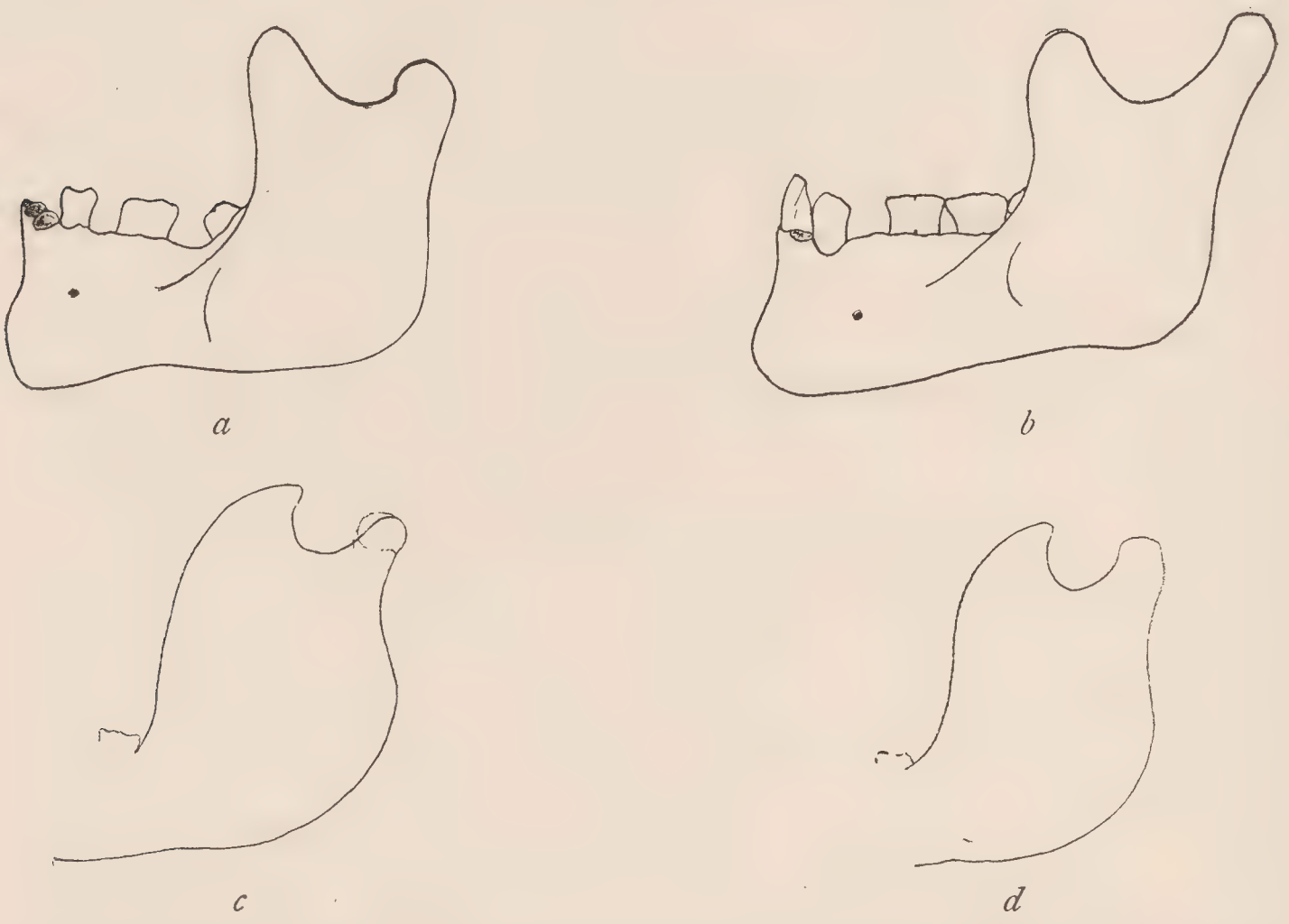

Fig. 1. Lateral Views of Lower Jaws: *a*, From Valley of Mexico ($\frac{99}{252}$); *b*, Normal Male from Valley of Mexico ($\frac{99}{258}$); *c*, Male Gorilla (Coll. Phys. and Surg.); *d*, Female Gorilla (Coll. Phys. and Surg.).

(Plate I). The chin is of medium prominence. The vertical ramus is relatively broad. But the most remarkable characteristics of this jaw are the form and relation of its processes and the form of the sigmoid arch they enclose. The coronoid process is distinctly higher than the condyloid, although our subject is not an aged person. The condyloid process is very short, which is more apparent on the specimen itself than on the figure; and the sigmoid notch is much more open toward the front than toward the back. These characteristics of the upper extremity of the vertical ramus of the lower jaw are much more like those found in the Apes, particularly in the Gorilla, than in the human species. Fig. 1 is a stereographic drawing of this jaw, of two

jaws of adult Gorilla (reduced), and also of a normal jaw from the Valley of Mexico.

The external auditory meati are small, measuring 4 by 7 mm. The retromastoid vascular foramina are large. This characteristic, combined with unusual smallness, or even absence, of the parietal vascular foramina, is almost constant in other skulls from the same location, while series of skulls from other parts of Mexico show this phenomenon only exceptionally.[1] The base of the cranium is somewhat asymmetrical, which is the regular feature of skulls with occipital deformation. The bony processes of the base are of moderate strength. The left styloid is 2.7 cm. in length. The great wing of the left pterygoid process sends a slender, bony prolongation backward, which is almost met by a spicula of bone from the spinous process of the sphenoid bone; the two forming a slightly incomplete pterygospinous foramen. Various degrees of this anomaly are found in the majority of skulls from the same locality, although it is exceptional in other parts of Mexico. (A tendency to the formation of pterygospinous foramina is frequent in the whites.)

The various nervous and vascular openings of the base show nothing special in size or disposition. The anterior lacerated foramen is smaller than in whites. The foramen magnum is somewhat irregularly ovoid in shape, the anterior part being the narrower. It measures 3.2 cm. in length by 2.9 cm. in breadth, with an index of 90.6. The posterior nares are well formed, and not more oblique than in whites. They are smaller in length than in breadth, their index reaching 105.9. This high index of the posterior nares is another characteristic of skulls from St. Simon Tonaguac. The petrous parts are slightly depressed below the level of the base. The glenoid fossæ are of fair depth. The palate is slightly parabolical in outline, and normal. The dental arches are strong, without being too massive.

Dentition has been completed. Most of the teeth are lost, apparently since death, as the alveoli show no signs of obliteration or absorption. The remaining teeth are of medium size, and normal in shape, but are set somewhat irregularly. The left upper and both lower wisdom teeth point almost directly forward,

[1] The inverse relation between the size of the retromastoid and the parietal vascular foramina is not uncommon.

and somewhat inward; and on the right side of the upper alveolar process in front, we find a diastema between the first incisors; while the first bicuspid is situated over and a little behind the neighboring canine.

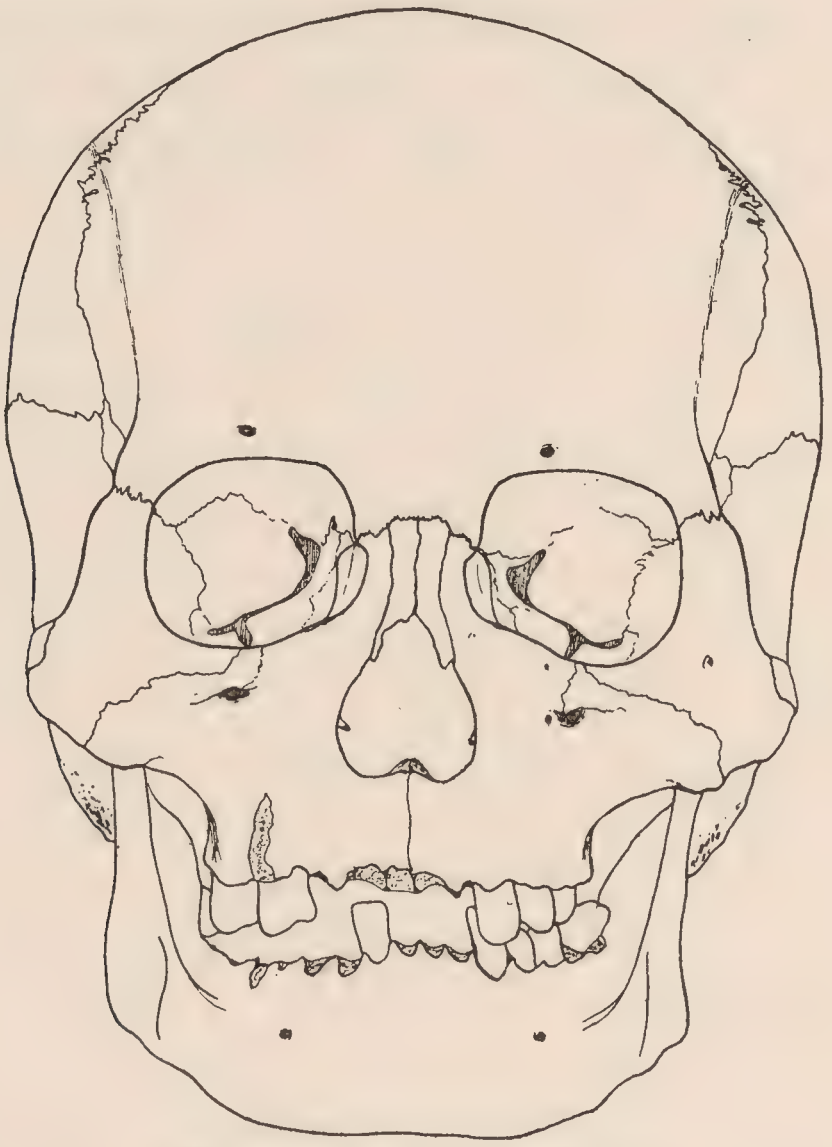

Fig. 2. Norma Anterior ($\frac{99}{252}$).

In the interior of the skull, as far as this could be examined, there was found nothing special. The frontal crest is low.[1] By Broca's method, the capacity of the skull is 1270 cm.; by Flower's, 1225 cm. This is the lowest of the capacities of the male skulls from St. Simon. (Figs. 2–6.)

MEASUREMENTS OF SKULL.[2]

CRANIUM

Maximum antero-posterior diameter	15.6	cm
Maximum transverse diameter	14.0	cm
Cephalic index [3]	89.7	
Height (basion-bregma)	12.9	cm

[1] The sharp crest situated in the median line on the ventral surface of the frontal bone differs, both in extent and height, in different individuals. In its extremes it may possibly prove a racial characteristic, though never one of prime value.

[2] The French methods and nomenclature are followed throughout, unless otherwise indicated.

[3] These indices are of secondary value on account of the occipital deformation. The mean cephalic index of six male skulls from the same locality, with similar deformation, was 89.0; of three male skulls, without deformation, 80.0; of five female skulls, without deformation, 81.4.

Height-length index	82.7	
Height-breadth index	92.1	
Minimum frontal diameter	9.0	cm
Bistephanic diameter	11.0	cm
Bi-auricular diameter (between points where temporal depression begins, above the roots of zygomæ)	11.2	cm
Bimastoid diameter (between tips of mastoids)	9.8	cm
Basion-alveolar point	8.9	cm
Basion-nasion	8.8	cm
Basion-bregma	12.9	cm
Basion-obelion	10.8	cm
Basion-lambda	9.75	cm
Basion-inion	7.4	cm
ARCS		
Maximum circumference above the supra-orbital ridges	47.9	cm
Centres of external meati auditorii over forehead, above the ridges.	28.0	cm
Centres of external meati auditorii over frontal eminences	30.0	cm
Centres of external meati auditorii over bregma	32.5	cm
Centres of external meati auditorii over maximum expanse of the cranial vault	33.3	cm
Centres of external meati auditorii over lambda	26.6	cm
Centres of external meati auditorii over inion	22.0	cm
Nasion-bregma	11.7	cm
Nasion-inion	28.3	cm
Nasion-opisthion	32.5	cm
Nasion-ophryon (Topinard)	2.0	cm
FACE		
Chin-nasion diameter	10.9	cm
Alveolar point-nasion diameter	6.55	cm
Bijugal diameter	11.5	cm
Maximum bizygomatic diameter	12.8	cm
Facial index, $\frac{\text{alveolar point ophryon height x 100}}{\text{maximum bizygomatic diameter}}$	66.8	
Maximum diameter (exterior) of upper dental arch	6.5	cm
Bimandibular diameter (between elevations marking the union of posterior with anterior ramus)	8.1	cm
Bigonial diameter	10.1	cm
Height (nose)	4.45	cm
Maximum width (nose)	2.4	cm
Nasal index [1] (platyrrhine)	53.9	
Height (orbits)	3.35	cm
Width " (inner edge of lachrymal canal at dacryon point to maximum outer point)	3.70	cm
Orbital index [2] (megasème)	90.5	

[1] Average of nine male skulls from same locality, 50.4; of five females, 53.0.
[2] Average of nine male skulls from same locality, 90.6; of five females, 91.5.

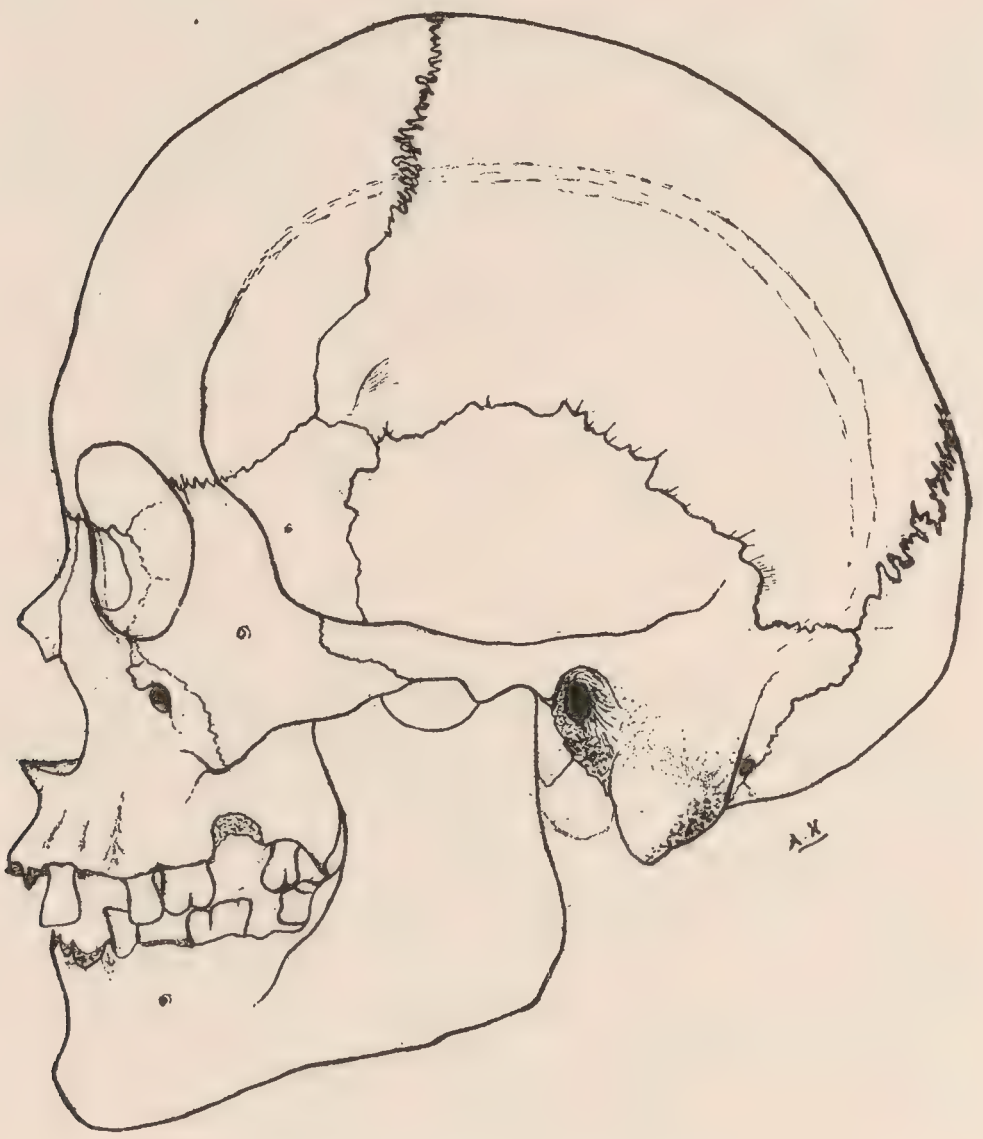

Fig. 3. Norma Lateralis ($\frac{99}{252}$).

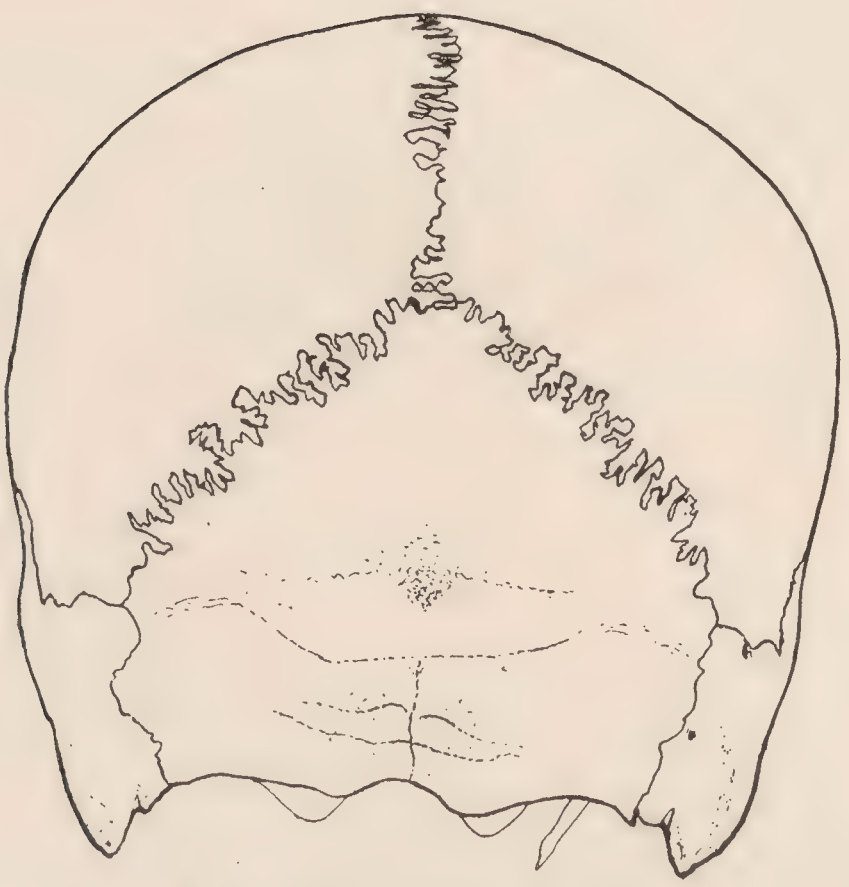

Fig. 4. Norma Posterior ($\frac{99}{252}$).

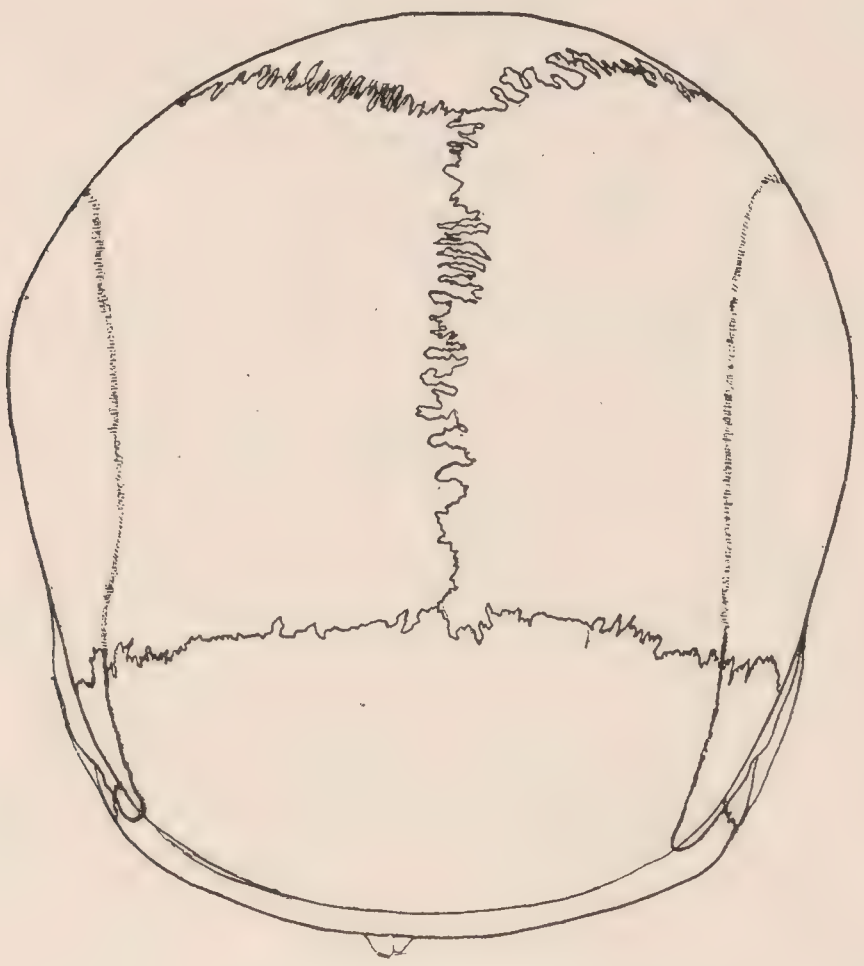

Fig. 5. Norma Superior ($\frac{99}{252}$).

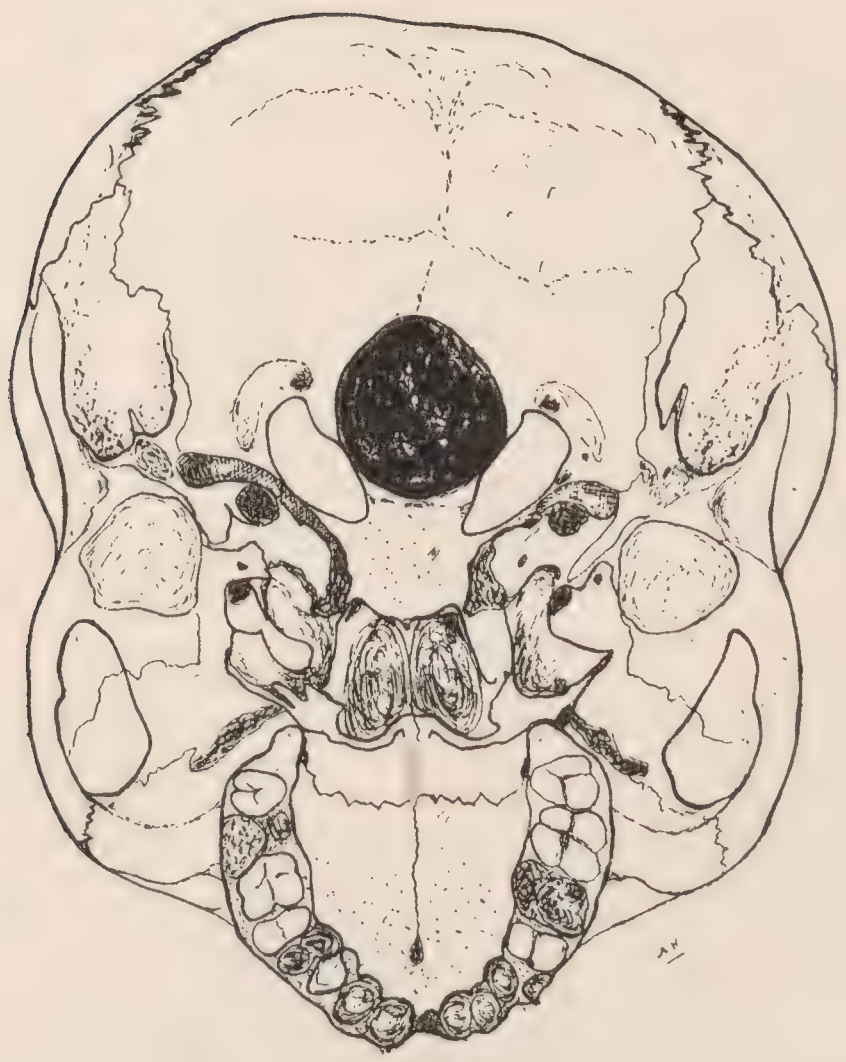

Fig. 6. Norma Inferior ($\frac{99}{252}$).

Height (upper dental arch) from alveolar point to nasal point.....	2.0	cm
Lower jaw (mentum to lower alveolar point).....	3.4	cm
Height of posterior ramus of lower jaw (coronoid process, 6.5 cm.; condyloid process, 6.0 cm.).....	6.25	cm
Length of anterior ramus of lower jaw.....	9.6	cm
Depth of sigmoid notch of lower jaw.....	1.63	cm
Angle.....	116°	
Thickness of lower jaw at symphysis.....	1.2	cm
Thickness of lower jaw at second molars.....	1.7	cm

BONES OF THE BODY.

VERTEBRAL COLUMN.

	Cervical Vertebræ.	*Dorsal Vertebræ.*	*Lumbar Vertebræ.*
Present.....	6 (6th wanting)	11 (12th wanting)	4 (1st wanting)
Conformation	normal	normal	normal
Spinous processes...	bicuspid to 5th	resemble lumbar from 10th	bodies broad except 5th, which is of moderate breadth
Maximum antero-posterior diameter at middle.....	of 3d, 3.90 cm	of 6th, 5.10 cm	of 5th, 6.90 cm
Antero-posterior diameter of body....	" 1.40 cm	" 2.45 cm	" 2.90 cm
Maximum lateral diameter.....	" 4.50 cm	" 5.40 cm	" 9.20 cm
Maximum lateral diameter of body....	" 1.75 cm	" 2.45 cm	" 4.50 cm
Antero-posterior diameter of canal....	" 1.40 cm	" 1.55 cm	" 1.35 cm
Maximum lateral diameter of canal....	" 1.85 cm	" 1.45 cm	" 1.90 cm
Height (body).....	" 1.10 cm	" 1.85 cm	" 2.75 cm
Length of spinous process (from notch)	" 1.75 cm	" 4.30 cm	" 3.15 cm " 4.20 cm

The bones are of rather sub-medium size and strength for a male, and differ in no important characteristic from the vertebræ of whites.

Sacrum.

This is composed of six segments;[1] but the sixth segment is somewhat rudimentary. The first body is only partly united to the rest of the bone. The lowest (fifth) pair of foramina is incomplete in the back. The inner curve of the bone is rather small, and commences below the third segment.

[1] The only two other sacra from the same locality, and now in this Museum, are each composed of six segments.

Maximum length of sacrum	12.6 cm
Maximum breadth of sacrum	11.0 cm
Index of entire bone [1]	87.2
Index of bone, excluding sixth segment	99.1

Thorax.

The constituents of the thorax of this skeleton are very remarkable. There are 26 ribs present, instead of 24, the usual number. By careful and repeated examinations, the characteristics of these ribs have been found entirely homogeneous, so that it is impossible to eliminate any pair as extraneous. Of these ribs 13 are right, and 13 left. They agree in color, form, and size. The skeleton, so far as we know, was found isolated, was kept together, and in the Museum it has since been kept separate. No question as to the identity of all the ribs with the skeleton has been raised by any one of the numerous scientists who have examined it.

We have here a pair of supernumerary ribs. The question is, Which of the thirteen pairs is the supernumerary one? Examination of the ribs alone does not satisfy us on this point. There are two pairs of floating ribs, as usual; and none of the remaining pairs can be distinguished from the regular ribs. On examining the vertebræ, however, we find an articular facet on each side of the seventh cervical; and a reconstruction of the upper part of the thorax demonstrates that the ribs begin at this vertebra, not at the first dorsal. There is no rudimentary or floating cervical rib. The first pair of ribs, although presenting an anomaly on one side, which will be described later on, has otherwise all the characteristics of the regular first dorsal ribs; and in the same way all the following pairs of ribs resemble the corresponding regular pairs of the normal thorax. Granted that the two uppermost ribs are cervical, the condition is really then that of an extension of the thorax upward, which is much more interesting than the existence of a rudimentary pair of cervical or other ribs. Sir William Turner, who on his last visit to the United States examined the skeleton, particularly the ribs, expressed the opinion that we have here a pair of cervical ribs articulating with the seventh cervical vertebra, and that all the thoracic

[1] This index is in the male European 112; in the female European, 116; in the Negro, 106; in the Australian, 99; in the Andamanese, 94; in the Orang, 87; in the Gorilla, 72. Sir William Turner: Journal of Anatomy and Physiology, XX, and Challenger Reports, Zoölogy, XVI.

structures, the blood-vessels included, were elevated, the extra cervical ribs assuming the anatomical relations which ordinarily belong to the first dorsal pair.

The greater number of ribs, however, is not the only peculiarity in the case. Examination of the ribs of the left side shows the first and second ribs partly blended together. The spinal articular parts of both ribs are normal, though much closer together than they would be ordinarily ; and the bones continue independent for about 2 cm., at which point they gradually blend and form one rib. This shows no further marks of union, and is much broader and stronger than the first rib of the right side, which has a large single articular surface on the sternum, situated lower than the corresponding one of the other side. The third ribs are normal, and equal on both sides ; and none of the remaining pairs show any thing unusual. The maximum breadth of the conjoint rib on the left is 2.2 cm.; that of the first right rib, 1.3 cm. (Plate III.)

The anomaly just described is rare in the human species. It has received the name of ' bicipital rib.' It was first described by M. Hunauld,[1] and was given considerable attention by Sir William Turner.[2] The anomaly occurs invariably at the apex of the thorax (Turner), and consists mostly of a union of a cervical rib with the first thoracic.[3] The anatomical peculiarity, according to Sir William Turner,[4] "is not due to a bifurcation of the shaft of a single rib at its vertebral end into two heads, but to the fusion of what ought to have been the shafts of two distinct ribs into a common body." The significance of the anomaly, when due to a union of a cervical with the first thoracic rib, must be about the same as that of a free cervical rib, the causes of which are not yet fully established.

Supernumerary ribs occur both in man and in lower animals, and signify in all probability a recurrence of lower forms. Cuvier found supernumerary ribs in the bison ; Turner says the condition is quite common in the Cetaceæ ; and I have been told by naturalists of examples of this kind in other mammals. Dr. F. Boas informs me that he found supernumerary ribs and vertebræ

[1] Mémoires de l'Académie Royale de Paris, 1740, p. 525.
[2] Journal of Anatomy and Physiology, IV, November, 1869 ; V, May, 1871 ; XVII, April, 1883, pp. 384–400.
[3] R. Knox : London Medical Gazette, November 3 and 10, 1843.
[4] Journal of Anatomy and Physiology, XVII, p. 387.

in quite a high percentage of human skeletons from northwest Vancouver Island,[1] and references to such phenomena are found in medical literature. In the majority of cases, the supernumerary ribs are cervical.[2] Single supernumerary ribs are not so infrequent as the bicipital ribs, though I have lately seen in Professor Dwight's collection in the Anatomical Museum of the Harvard Medical School, Boston, Mass., a specimen of bicipital rib, much like that here described.[3]

The union of two ribs in the manner here observed, in whatever portion of the thorax it may occur, implies a deficient evolution of one of the ribs concerned, and a fusion of the two bones along more or less of their course during the early stages of ossification of the parts. If the supernumerary rib is so deficient, as it is in this case, it shows that its cause, be it a reversion or any thing else, was less complete in this than in other instances where a similar rib is free.

Measurements of the Normal Ribs.

Dorsal arc of longest right rib	30.3 cm
Antero-posterior diameter between extremities of the bone	20.5 cm
Greatest height of ventral curve	7.5 cm
Dorsal arc of longest left rib	30.0 cm
Antero-posterior diameter of longest left rib	20.2 cm
Greatest height of ventral curve	7.5 cm

The left ribs average about 6 mm. shorter than the corresponding right ones.

Sternum.

The sternum is 13.4 cm. high, and its maximum width is 5.4 cm. The whole bone is ossified,[4] the original separations being marked by slight bony ridges. The lowest segment is perforated by two large foramina, the upper round, the lower oval. The left border of the sternum appears less developed in its upper third than the right, and is shorter, giving the bone a certain degree of curvature to the left. (Fig. 7.)

[1] These specimens are in the Field Columbian Museum, in Chicago, and have not been described.

[2] For further literature on the subject, see end of the paper.

[3] Since the above was written, I brought from Mexico (State of Jalisco) another bicipital rib; and I also found in Professor Huntington's anatomical collection, at the New York College of Physicians and Surgeons, a rib which represents an ancient fusion of the anterior portions of two bones, and has two articular facets anteriorly. (Plate II, Fig. 2.)

[4] Complete ossification of the sternum, except in very advanced age, is decidedly an exception among the Indians, in whom I generally find the manubrium detached.

There are 7 articular facets for the ribs on the right side, and 6 on the left; the first facet on the left occupying the place opposite and nearly between the right first and second. This form of the sternum shows that the anomaly of the ribs originated early in the embryonic life of the individual. The blending of the first pair of ribs may be of a later though still fœtal origin, and is less significant.

Fig. 7.
Front View of Sternum ($\frac{99}{252}$).

When reconstructed, the dorsal part of the spinal column of the skeleton shows a moderate lateral curvature, convex to the left, and due no doubt to compensation for the lowering of the left side of the thorax, caused by the joined pair of ribs.

UPPER EXTREMITIES.

Clavicles.

The clavicles present nothing unusual. Their mean length is 12.2 cm., and the bones are rather slender.

Scapulæ.

The bones are light, and their form approaches that most common in the whites.

Total height (inferior angle to superior angle)	14.1	cm
Inferior angle to middle of glenoid fossa	13.5	cm
Maximum breadth (lower border of glenoid to maximum point on posterior border)	9.3	cm
Depth of glenoid fossæ	0.4	cm
Maximum depth of subscapular fossæ	1.8	cm
Maximum point of width on vertebral border to end of acromion	12.8	cm
Maximum point of width on vertebral border to inferior angle,	10.45	cm
Total scapular index,[1] $\frac{\text{maximum breadth x 100}}{\text{total height}}$ (Broca)	65.9	

[1] This index is in the European 64.3; in the Bushmen, 66.2; in the Polynesian, 66.6; in the Chinese, 66.7; in the Peruvian, 66.5. Sir William Turner: Challenger Reports, XVI, p. 86.

Long Bones of the Arm.

These bones are of about medium size, and of normal shape. Both ulnæ are lost.

Length of right humerus	30.3 cm
Length of left humerus	30.6 cm
Mean antero-posterior diameter at middle	1.9 cm
Mean lateral diameter at middle	1.4 cm
Bicondyloid diameter	4.5 cm
Natural perforation of right olecranon fossa	8 x 6 mm
Natural perforation of left olecranon fossa	6 x 4.5 mm
Length of each radius (nothing special in aspect)	24.6 cm
Humero-radial index [1]	80.78

Our subject, according to this scale, had his fore-arms, in proportion to his arms, even longer than the Negro, and is surpassed in this respect only by the Andamanese and by the Chimpanzee and the Orang. This index has full value with the subject in question, as all the bones of his upper extremities are entirely normal. But few of the bones of the hand are present. They are rather slender, small in size, and show nothing unusual.

Pelvis.

The ossa innominata are normal, of medium strength. The whole pelvis is symmetrical, but unusually small.

Maximum height of ossa innominata	18.7 cm
Maximum breadth of ossa innominata	13.1 cm
Maximum lateral diameter of pelvis (between external iliac crests)	25.5 cm
Pelvic index [2]	136.3

Multiplying the width of the pelvis by 100, and dividing the product by the height of the ossa innominata, gives the pelvic index. As seen by the table above, this index in the specimen in question is exceeded by that of a European woman only. The proportion of pelvic breadth to pelvic height has no bearing on the spaciousness of the basin, which, as seen from the absolute values, is below the medium. The distance from the anterior and superior

[1] This index is in the Eskimo 71 ; in the European, 74 ; in the Australian, 77 ; in the Negro, 79 ; in the Andamanese, 81 ; in the Gorilla, 80 ; in the Chimpanzee, 90 ; in the Orang, 100. Quain : Anatomy, Osteology, p. 99. London, 1893.

[2] This index in a European woman reached 136.9. In 46 male Europeans, it averaged 126.6 ; in 17 male African Negroes, 121.3 ; in 20 anthropoids, 105.6. Topinard : Elements d'Anthropologie, p. 1049.

part of the pubis to the tip of the first sacral spinous process is in this case 15.6 cm.

Internally: superior strait

Antero-posterior diameter	9.0 cm
Maximum lateral diameter	11.5 cm
Index of superior strait (showing a high standard)	78.2
Oblique diameter of superior strait	11.4 cm
Tip of sacrum to inferior lip of pubis	10.4 cm
Greatest interior separation of tubera ischii	9.0 cm
Diameter between ischiatic spines	7.6 cm
Subpubic angle, measured by projection	about 58°

Obturator foramen, medium size, obliquely triangular.

LOWER EXTREMITIES.

The bones of the lower extremities of this skeleton are inferior in strength to similar bones of an average white person. The long bones of the two limbs differ somewhat in length, the right femur and left tibia and fibula each being about 4 mm. longer than the same bones of the opposite side.

FEMORA.

The shape of the thigh-bones is rather peculiar. The neck is somewhat longer than in the average white. Below the smaller trochanter, the shaft is flattened (platymeric) antero-posteriorly. This flattening is not an anomaly, but a special ethnical characteristic, which I have found in many places in Mexico and elsewhere on this continent. (Fig. 8.) Below the upper third, the shaft of the femur becomes almost circular, and shows a moderate curvature forward.[1] The linea aspera is not very pronounced. The condyles are normal.

Fig. 8. Horizontal Section of the Right Femur 2 cm. below the Smaller Trochanter: *a*, Internal Border; *b*, External Border; *c*, Anterior Surface; *d*, Posterior Surface.

Antero-posterior diameter of shaft 3.5 cm. below minor trochanter	2.0	cm
Lateral diameter of shaft 3.5 cm. below minor trochanter	2.9	cm
Average length of femur	40.9	cm

[1] The curvature of American femora often exceeds that of the femora of whites, and equals that of the Negro.

Maximum length of right femur	41.1	cm
Maximum length of left femur	40.7	cm
Antero-posterior diameter at centre	2.3	cm
Lateral diameter at centre	2.25	cm
Maximum breadth of condyles	6.7	cm
Maximum antero-posterior diameter of condyles	5.6	cm
Angle of neck	130°	

Tibiæ.

These bones present at least two interesting characteristics: they are to a certain degree platycnemic; and their heads, and the planes of the articular surfaces of the knees, are much more inclined backward than is usual. The shape of the tibiæ, in transverse section at or above the middle, is quadrangular. The platycnemic condition of the tibiæ is not especially significant. We find this characteristic distributed over immense areas of this continent, and in types of people differing physically to a considerable extent. Flat tibiæ abound in Mexico, in our own southwest among the pueblos and the cliff-dwellers, in the great Mississippi basin among the mound-builders, as well as farther east to Florida, and farther west and north to British Columbia. I have measured flattened tibiæ from Peru and Bolivia; and as the range of anthropological material increases, this characteristic, rare in white races, is found common to vast regions, and apparently over both Americas.

The backward inclination of the heads of the tibiæ in this skeleton is a very marked characteristic, one much less frequent than the flattening of tibiæ, and equally as interesting. I present two drawings of the upper part of one of the bones in question. These drawings demonstrate the inclination of the heads and the articular surfaces to the axis of the shaft. The inclinations are considerable, and involve the facets. (Figs. 9, 10.)

The significance of this structural peculiarity is not clear. It is not certain that such an inclination of the head, and even of the articular facets, would necessarily affect the straightness of the limbs, and cause an inclination of the knees forward; for a little overgrowth of the posterior parts of the femoral condyles could easily produce the proper compensation for such an inclination. Such compensation would be detected only with considerable difficulty, due to the form of the femoral condyles, and I

am not positive whether it exists in this case. When the femur and tibia of one side are applied together, they can be adjusted in a straight line, without showing any unnatural position of the articular surfaces.

Inclination of the head and of the articular facets of the tibia may be influenced by an habitual squatting position. Lighter grades of inclinations of the head of the tibia to the shaft are

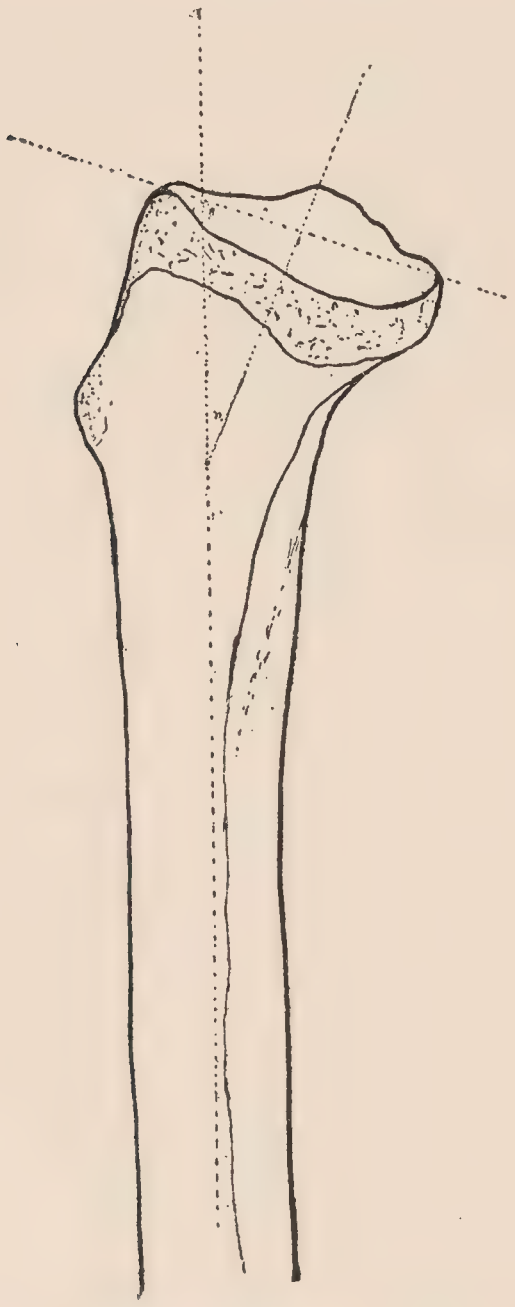

Fig. 9. Inner Side of Tibia ($\frac{99}{252}$).

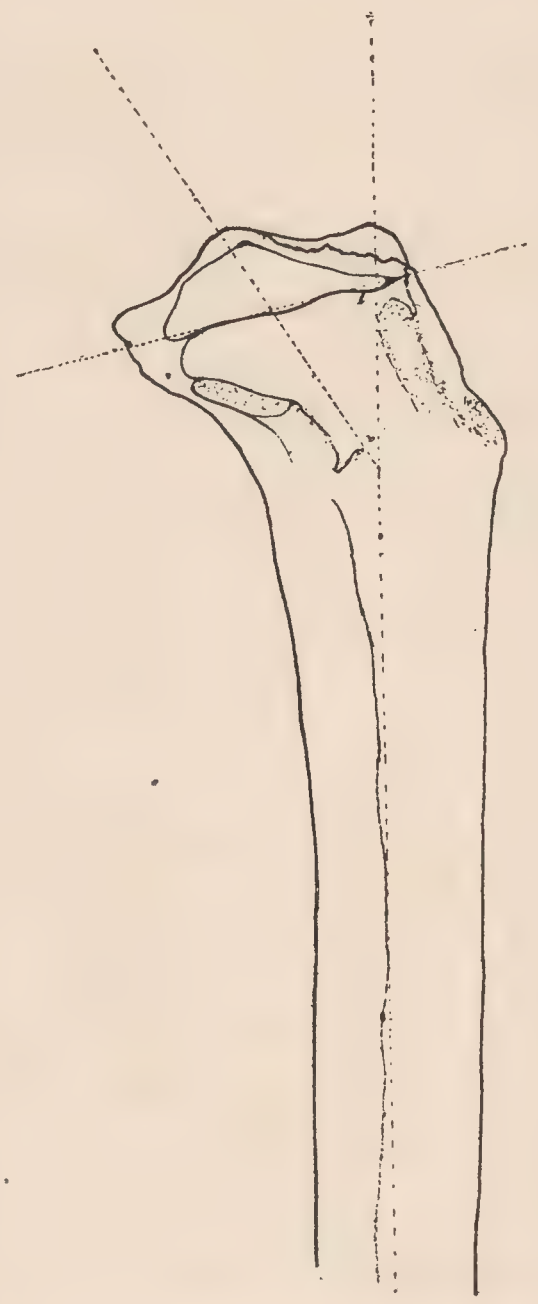

Fig. 10. Outer Side of Tibia ($\frac{99}{252}$).

occasionally seen in all peoples; but so high a degree as the tibiæ of this skeleton present is very rare, and especially so in the white race. I have seen similar inclinations of the facets, and especially of the head of the tibia, in Apes, particularly in the two adult Gorillas preserved in Professor Huntington's Anatomical Museum in the New York College of Physicians and Surgeons. The meaning and import of this structural peculiarity, I believe, cannot be definitely solved at present, but must be relegated to

further specific studies. It is less rare in Americans than in many other races of people. I have seen several grades of it in tibiæ from different parts of this continent, in one belonging to the ancient Utah people, for instance; and I found it quite common among our Mexican tribe, the Huicholes (Jalisco).[1]

Average length of tibiæ	35.45	cm
Length of right tibia	35.3	cm
Length of left tibia	35.6	cm
Mean antero-posterior diameter at middle	2.8	cm
Mean antero-posterior diameter at nutritive foramen	2.95	cm
Mean lateral diameter at middle (the right bone is slightly thicker)	1.65	cm
Mean lateral diameter at nutritive foramen	2.0	cm
Index[2] at middle	58.9	
Platycnemic index at nutritive foramen[3]	67.8	
Femoro-tibial index of this skeleton[4]	86.7	

Thus it is seen that our subject is as remarkable for the great length of his tibiæ compared to his femora, as for similar relations of the bones of his fore-arms and arms.

Fibulæ.

Their form is similar to that of whites.

Length of right fibula	34.4	cm
Length of left fibula	34.8	cm
Proportion of lower limb (femur + tibia) to upper (humerus + radius) as	138.7 to 100.0	

Right Patella.

Maximum height	4.4	cm
Maximum breadth	4.6	cm
Maximum thickness	2.15	cm

[1] See on this subject Collignon, Rev. d'Anthrop., 1880, v. IX; A. Thomson, J. of Ana. & Phys., London, XXIII, p. 616; Fraipont, Arch. de Biol., Gand, 1887, VII, f. III; also Rev. d'Anthrop., 3me série, t. III, p. 145.

[2] This index averages 71.1 in the white male, and 71.9 in the white female.

[3] This index was in 48 African Negroes (Topinard) 71.0. In Americans (Jeffries Wyman, Washington Matthews, and others), it ranges from 40 to 70; and I found it to be in a male adult Gorilla, 61.8; in a female adult Gorilla, 65.6; in an adult Orang, 73.9; in a young Orang, 82.7.

[4] This index in 22 tall European males was 81.1; in 22 short European males, 79.7; in 5 Chinese males, 80.2; in an Eskimo, 78.7; in 5 Polynesians, 82.2; in 3 Australians, 82.1; in 4 Blacks of India, 82.8; in 32 African Negroes, 82.9; in 8 New Caledonians, 83.1; in 2 Tasmanians, 83.6; in 5 male South Americans, 84.1. This index is somewhat higher in the female of most races. In 2 female Bushmen it was 85.8; in a female Arab, 86.3; in a female Negrito, 89.0; in 6 female South Americans, 83.1. Topinard: Elements d'Anthropologie, p. 1045.

RIGHT CALCANEUM.

Maximum length	7.4	cm
Breadth of body (in middle)	3.3	cm
Height of body " "	4.5	cm

The small bones of the foot present nothing special.

In conclusion, then, the skeleton just described possesses the following principal points of interest: a pair of supernumerary ribs with all the characteristics of regular ribs; very high relative lengths of the bones of the fore-arm and of the leg, and of the sacrum; and the peculiar lower jaw. As secondary points of interest, may be enumerated the small cranial capacity, the blending of the first left pair of ribs with consequent deformity of the spinal column and of the sternum, the pterygospinous foramen (ossification of pterygospinous ligament), the sternal foramina, the perforation of the olecranon fossæ of the humeri, the six segments of the sacrum, the platymery of the femur, a certain degree of platycnemia, and marked inclination backward of the head and of the articular facets of the tibiæ.

In measurements, the skull is highly brachycephalic with but comparatively moderate compression of the occiput: uncompressed, the head could not possibly have been dolichocephalic. The face is mesosème, or of medium breadth in relation to its height. The orbits are high, or megasème. The nasal aperture is lower and broader than in the whites, and platyrrhinic. The posterior nares are of lesser height than breadth. The angle of the lower jaw is low. There is more prognathism in appearance than is shown by measure; it is confined to the upper alveolar process. The humeri show no unusual torsion. The femoral angle is within the limits of the ordinary. The proportion of lower to upper limbs is as 138.7 to 100. The pelvis is rounder than in the European, but considerably smaller. The feet and hands were slender. The subject was right-handed, or, more properly, right-sided, as is indicated by the greater strength of the bones of the extremities on the right side.

So much for the more interesting anatomical characteristics of this skeleton. The next question is, What is the anthropological significance of all the peculiarities observed in this one body? It is clear that a skeleton devoid of pathological abnormities—which is fully adult and not too aged, and which presents such

characteristics as this shows—is an exceptional, if not unique occurrence. If the skeleton represents a race of people, it is of the highest importance to know more about this race and its place in the rise of mankind. It is safe to say that this is the skeleton of a being zoölogically on a lower scale than is the average white man of to-day, and much inferior even to the known old or present inhabitants of the Valley and State of Mexico. Many of the characteristics of this adobe skeleton approach those of the skeletons of the anthropoids.

The Museum has in its possession but few whole skeletons from the same locality, and none of these show any marked abnormality. On the other hand, only a few of the peculiarities observed in this specimen are such as usually occur otherwise than racially in a normal individual. It seems, however, that, having but one skeleton to consider, the question of individual or racial character of the abnormalities must remain an open one, pending further investigations on additional material from the same locality.

To which of the Mexican ethnic groups do this skeleton and the skulls from the same region belong? For a satisfactory answer there is requisite somatological knowledge of the various groups of the inhabitants of that old and ethnologically highly important region, the Valley of Mexico, as well as a precise knowledge of the geological and archæological conditions of the adobe deposits with their various layers. Of this fact we are certain, that from prehistoric time there have dwelt in the Valley of Mexico a number of more or less distinct peoples, and that most of the people who have been settled in that valley within the last twelve or fifteen hundred years belonged to a stock collectively termed 'Nahuatl.' The very last of the Nahuatl branches who gained supremacy in the valley were the Aztecs, whose progeny occupy to-day some of the regions around the City of Mexico. There can be no doubt that the skeleton described is ancient. Does it belong to the Aztec people, or does it date still farther back,—to some of the Aztec predecessors?

Little is known anatomically about the Aztecs. What we do know is mainly due to Hamy and Quatrefage of Paris. Sergi examined a number of Aztec skulls; and I had occasion to examine some, among which was that of a normal adult male, whose

ancestors were known. The characteristics of Sergi's and my own specimens accord in the main with the observations of Hamy. The main features of these presumably Aztec skulls are, that not one of them has been found artificially deformed in any way, and that they are regularly dolichocephalic. In both these characteristics, this skull, with a number of its companions, differs from Aztec skulls. A number of the male specimens are deformed ; and their lowest indices, even in the totally undeformed crania, are but mesocephalic. These crania have belonged to some much shorter-headed people than were the Aztecs, possibly to a different race of people. This race lived contemporaneously with, or but little anterior to, this last branch of the Nahuatl family, for the short skulls are found together with the long ones.

Previous to the Aztecs, the Valley of Mexico is said to have been occupied by the so-called Chichimecs, of whom ethnically and physically we know little. Still earlier the region was peopled by the so-called Toltec nation. Of the pre-Toltec inhabitants of the valley, every thing is uncertain.

The Toltecs have left great monuments, and no doubt also a large number of osseous remains, for which, as yet, no systematic search has been made. Our knowledge of them is due either to archæological excavation or to accident. What material has been secured is seldom properly identified, and is so scattered as to be inaccessible to a single student. Nevertheless, the references in anthropological literature to the skulls of these people all agree in the main particulars. The most extensive of these references is to be found in Morton's 'Crania Americana.' Morton, it is well known, attributed to the Toltecan people a great extent and high importance. Another mention of Toltec skulls is to be found in Quatrefage and Hamy's 'Crania Ethnica ;' and still another, though not direct, is in the 'Catalog de la Collection de Anthropologia del Museo Nacional,' por Alfonzo L. Herrera y Ricardo E. Cicero.

In all the above descriptions the Toltecan skulls are represented as more or less brachycephalic, and often deformed. These are likewise the prominent characteristics of one portion of the St. Simon skulls, including the cranium of the skeleton described. The six more or less deformed male skulls of the collection show cephalic indices of from 86.0 to 93.4 ; three male

undeformed skulls reach indices of from 77.4 to 81.7 ; and the average cephalic index of the five undeformed female skulls is 81.4. The illustrations which Morton gives of his Toltecs agree also with the shape and general aspects of some of the skulls from St. Simon. For comparison three views of male skulls from this place are given in Plates IV and V, the middle one being that of the above-described skeleton.

Morton and Meigs considered as Toltecs all American aborigines who attained a certain degree of civilization, and included within this group the mound-builders, the cliff-dwellers, and others. Outside of Toltecs there was only one more group of Americans, and those were the Barbarians, which included most of the North and South American Indians. Since Morton and Meigs, however, the term 'Toltec' has become gradually restricted ; most historians and most recent authors understand by it the people who occupied the Valley of Mexico before the Chichimecs, Acolhuas, and Aztecs,—people who may also have belonged to the Nahuatl stock, and who disappeared before the later Nahuatl invasions, leaving behind them signs of high culture, and possibly a part of this culture itself.

Under these conditions it would be very difficult to define the proper ethnic nature of the specimen. I cannot term it the skeleton of a Toltec, so long as the vagueness of this term continues. The possibility that it is Aztec cannot be excluded but then it would be greatly exceptional. Nothing more definite can be established until the Mexican Valley adobe deposits have been thoroughly explored and studied, and until we possess large collections of 'Toltec' and adobe skulls and skeletons.

However, the uncertainty as to the particular race to which the subject belonged is really of secondary importance, and, it is hoped, will not detract from the interest of the features of the skeleton which have been made the subject of this paper. In conclusion I may remark that human osseous remains from various parts of Mexico are prolific in interest, and particularly in zoölogically inferior characters, and that they deserve pre-eminently the thorough attention of anthropologists.

FURTHER LITERATURE ON BICIPITAL, CERVICAL, AND SUPERNUMERARY RIBS.

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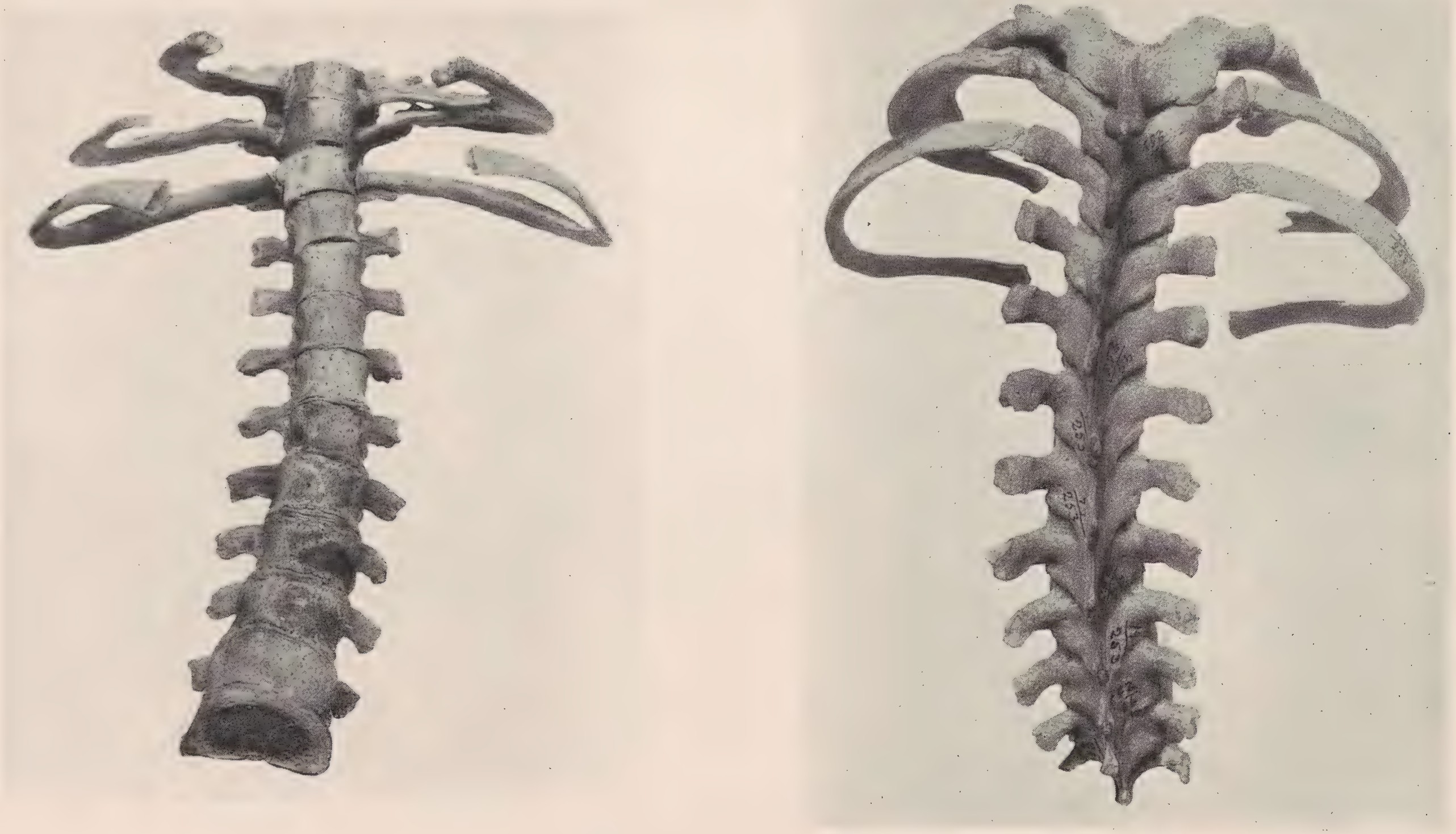
Front and Side Views of Skull, No. $\frac{99}{252}$.

Fig. 1. Lateral View of Lower Jaw, No. $\frac{99}{252}$.

a *b*

Fig. 2. *a*, Bicipital Rib (fragmentary) from an Ancient Burial-Place in the State of Jalisco, Mexico; *b*, Broad Rib with two Facets, formed by Union of First and Second Ribs; Provenience Unknown. (Anat. Coll., Coll. Phys. and Surg.)



Ventral and Dorsal Views of Ribs and Spinal Column, No. $\frac{99}{253}$.

Lateral View of Three Brachycephalic Skulls from the Adobe Deposits of St. Simon, Valley of Mexico.

Front View of Three Brachycephalic Skulls from the Adobe Deposits of St. Simon, Valley of Mexico.

Article VI.—THE ANCESTRY OF CERTAIN MEMBERS OF THE CANIDÆ, THE VIVERRIDÆ, AND PROCYONIDÆ.

By J. L. Wortman and W. D. Matthew.

Plate VI and Ten Text Figures.

The Eocene deposits of North America have yielded from time to time a large number of remains of primitive flesh-eating mammals whose nearest affinities appear to be with the modern Carnivora, although not a few of them, so far as their dentition is concerned, exhibit resemblances to certain of the Insectivora. This group has been held by some to represent a distinct order, and is considered by many authors under the name Creodonta, originally proposed for it by Cope. By others it has been placed as a suborder of the Carnivora, while still others have referred to it under the name Carnivora Primitiva.

Without entering into a discussion of the merits of this group to rank as a separate order or even a suborder, it is sufficient to observe in the present connection that it is not capable of very exact definition, and if it is desirable to retain a separate grouping of these forms it must be done with the understanding that it is purely as a matter of convenience.

That they stand in direct ancestral relationship to the later appearing families of the modern Carnivora, there can be no question whatever, but whether these families arose from one or several points among the Creodonta has never been demonstrated. In fact no actual contact between the two groups has ever been satisfactorily traced, and while many suggestions have been made in regard to these connections, they have, up to the present, been unsupported by any direct proof.

It is the object of the present paper, therefore, to trace the ancestry of two important modern families of the Carnivora directly backward into the Creodonta. We will also take occasion to point out the descent of several somewhat aberrant species of the existing Canidæ.

Another important discovery included in the present paper deals with the origin of the American family Procyonidæ, which is now shown to have existed as far back as the upper Oligocene.

I.—The Short-jawed Dogs of the Eocene.

Uintacyon[1] *Leidy.*

This group of species has been found thus far in the Wasatch, Wind River, and Bridger beds, and is represented so far only by more or less complete specimens of the lower jaws. In one species, *Uintacyon vorax* from the Bridger, a few fragments of the skeleton are known, but beyond this the materials are very deficient. Most of the species which we place in this genus have been referred to *Miacis*, a genus originally established by Cope upon a jaw fragment from the Bridger.[2] It now appears, however, that this first described species, and therefore the genus *Miacis*, is synonymous with the genus *Vulpavus*, previously established by Marsh upon a first superior molar.[3] The name *Miacis* will therefore have to be abandoned and the name *Uintacyon*, given by Leidy, substituted. Leidy's type of *Uintacyon edax* is anomalous, in that it possesses five premolars instead of the normal number four, but this is not open to very serious objection, since the shape and position of the extra tooth will convince almost any one at a glance of its abnormal nature.

As the genus stands at present no very striking or trenchant characters can be assigned to it which will separate it sharply from its Bridger contemporary, *Vulpavus*. Although the upper dentition is completely unknown, there can be very little doubt that the most important distinctions between the two will be found to consist in the number of superior molars. In *Vulpavus* they are reduced to two, as in the modern genus *Canis*, while there can be very little doubt that the number was three in *Uintacyon*. The only positively known character by which the two genera can be separated at present, is seen in the thick, heavy lower jaw, together with the abruptly rounded chin. In *Vulpavus*, on the other hand, the jaw is relatively slender and without the abrupt chin, quite as in the modern Canidæ.

There are apparently several distinct lines of species in this genus reaching from the Wasatch into the Bridger. In one precocious series the jaw is remarkably deep and short, the lower

[1] Proc. Acad. Nat. Sci. Philada. 1872, 277.
[2] Proceed. Amer. Philos. Soc. Aug. 1872, 740.
[3] Amer. Jour. Science, Aug. 1871.

canines laterally flattened, and the anterior premolars much reduced. In another line the jaw is somewhat more slender but still very short, the lower canines laterally compressed, but the premolars are not especially reduced in size. A third section includes a single very small species from the Bridger in which the jaw is very short and deep, the canines not flattened, and the premolars unreduced. In a fourth section the jaw is much more elongated and shallower, the canines not flattened, and the premolars are not reduced.

The dentition of the lower jaw is I. $\frac{3}{3}$, C. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{3}{3}$. The second pair of incisors is much displaced, being pushed back out of the transverse line. The sectorial is made up of an elongated trigon and a basin-shaped heel; the second molar exhibits a crown of similar composition, but the trigon is much lower and the anterior cusp considerably reduced. In some species the last molar is very small and single-rooted, while in others it is larger and is implanted by two distinct roots. One peculiar feature of all the short-jawed species of the genus is the great length of the molar as compared with the premolar series. In many the molars occupy quite one half of the tooth-line of the jaw.

Uintacyon promicrodon, sp. nov.

This species is represented in the collection by a single specimen of an almost complete lower jaw (No. 83), in which the sectorial and fourth premolar are in good state of preservation; portions of the third premolar and second molar, as well as the roots and alveoli of all the remaining teeth, are present. The species belongs in the first section of the genus mentioned above, and is its oldest known representative, coming as it does from the Wasatch. The chief distinctions between it and *U. canavus* from the Wind River is seen in the size of the fourth lower premolar in comparison with that of the first molar. In the species under consideration it is of normal size and holds about the same relations to the succeeding tooth in this respect as is commonly observed in the modern Canidæ, whereas in *U. canavus* this tooth is much more reduced.

The remaining premolars were remarkably small and weak, if we can judge by the size of the roots; the first was implanted by a single root, while the second and third each had two. The

crown of the fourth premolar has a prominent submedian cutting heel. The length of the lower dental series from the alveolus of the first premolar is 41 mm.

Uintacyon canavus[1] (*Cope*).

This species is represented by the jaws of four individuals in the collection, all from the Wind River beds [Nos. 4783 (type), 4784, 4786, 4798]. The type consists of a lower jaw bearing the first premolar, but displaying the roots of all the remaining teeth. In the other specimens the crowns of the other teeth are moderately well preserved, so that the lower dentition can be determined.

As compared with the preceding species, the jaw is not quite so deep and heavy, especially in the region of the symphysis, the anterior premolars are smaller and more spaced, and the fourth much more reduced than in the preceding species. Two of the specimens show the alveolus for the last molar, and indicate that this tooth was implanted by two distinct roots, whereas in the preceding species the alveolus is not divided.

In this connection it is proper to mention a specimen from the Wind River, consisting of the last two molars (No. 84), which does not agree with either of the Wind River species, *U. canavus* and *U. brevirostris*, in that the last molar is single-rooted, as it is in the Wasatch *U. promicrodon.* The premolars belonging to this type are entirely unknown, and it would not be at all surprising if another species is indicated by this specimen. If the anterior premolars are reduced, it undoubtedly represents the direct successor of *U. promicrodon* in the Wind River. Until better specimens are known, we refrain from proposing another specific name.

The entire length of the lower molar series of the present species as indicated by the type is 42 mm.

Uintacyon brevirostris[2] (*Cope*).

The type of this species consists of a lower jaw (No. 4785) from the Wind River beds; it is the only specimen known from this horizon. The jaw is short and deep, as in the preceding species, and the canine is laterally compressed. The premolars,

[1] Bull. U. S. Geolog. Surv. Terr. VI, Feb. 1881, 186.
[2] Bull. U. S. Geolog. Surv. Terr. VI, Feb. 1881, 190.

of which the crown of the fourth is preserved, show little or no reduction, differing in this respect from the preceding species in a marked degree. The second molar, whose crown is preserved in perfect condition, has a squarish outline with low tubercular cusps; the trigon is very slightly raised above the heel, and the anterior cusp is much reduced. The last molar was distinctly two-rooted. The length of the molars and premolars is 38 mm.

There are five specimens of lower jaw fragments in the collection from the Big Horn Wasatch which agree very closely with the above type and which we provisionally refer to this species. The premolars were apparently unreduced, the jaw of the same depth and shortness, and the last molar strongly two-rooted. In one specimen (No. 4224), however, the anterior portion of the second molar is less elevated, and the anterior cusp of the trigon more reduced than in the type specimen from the Wind River.

Uintacyon vorax *Leidy.*[1]

This species is not represented in the Museum collection and the description here given is from the type of *U. bathygnathus* of Scott,[2] which name is undoubtedly synonymous with that of the above species.

The specimen, like that of the type, is from the Bridger, and consists of the greater part of both lower jaws, one of which contains the heel of the sectorial and the second molar in perfect condition. There are also present the proximal end of the femur, distal end of the tibia and fibula, part of the proximal end of the ulna, distal end of radius, a complete fifth metacarpal, a part of a metatarsal, and two phalanges. The original type of the species consists of a fragment of the lower jaw bearing the second molar, preserved in the collection of the Philadelphia Academy.

As in the preceding species the premolars are not especially reduced, and the jaw is relatively deep and short. The last molar is single-rooted, and the size is considerably greater than in *U. brevirostris;* the length of the lower molar and premolar series is 51 mm.

The fragments of limb bones are not certainly known to belong with the jaws, but they seem to agree so well in every respect

[1] Proc. Acad. Nat. Sci. Phila. 1872, 277.
[2] Some Little Known Creodonts. Jour. Acad. Nat. Sci. Phila. Vol. IX, 172.

that there is comparatively little doubt that they do. They do not display any special characters which will serve to distinguish them from either the early Cats or Dogs. The more salient features may be stated to be a moderately well-developed third trochanter on the femur, a very slight grooving of the astragalus, as well as a well-flattened distal end of the radius, all of which belong to certain members of the early Canidæ and Felidæ.

Uintacyon pugnax, sp. nov.

This smallest known species of the genus is represented in the collection by a single nearly complete lower jaw (No. 1744), bearing the second and third molars in good preservation, together with the roots of the remaining teeth. The jaw is remarkably short and heavy, especially in the region of the symphysis, the canine is not laterally flattened, and the premolars apparently unreduced. The crowns of the second and third molars display the usual cusps, but the trigons are more elevated than in any of the preceding species. The length of the molar and premolar series is 27 mm.

Uintacyon edax *Leidy.*[1]

The type of this species and that of the genus is represented by a moderately complete lower jaw preserved in the collection of the Philadelphia Academy. The chief characters of this species are seen in the comparatively shallow, elongated jaw, as well as its smaller size. As already stated, the type displays an extra premolar, which is undoubtedly abnormal, since it is placed with its long axis transverse to the long axis of the jaw. Length of molar and premolar series, including the extra premolar, 33 mm.; canine not laterally flattened and premolars unreduced.

Several fragments of jaws from the Big Horn probably represent this species, but the specimens are so imperfect that the reference is uncertain.

Prodaphænus scotti,[2] gen. et sp. nov.

We propose this genus upon a series of upper molars (No. 11,238) of the Princeton collection, together with a lower jaw (No.

[1] Proc. Acad. Nat. Sci. Phila. 1872, 277.

[2] This species is dedicated to Professor W. B. Scott, of Princeton, whose contributions to Palæontology are so well known.

2510) of the American Museum collection, both from the Uinta. The distinctions between it and *Daphænus* of the White River Oligocene are especially seen in the characters of the superior molars; in *Prodaphænus* the external cusps are flanked by a broad cingular ledge which anteriorly is developed into two distinct cusps. The unusual extension of this ledge serves to increase the transverse diameter of the tooth, especially upon its anterior border, and on this account it resembles the corresponding tooth of *Viverravus* more than that of the Dogs in general. Another important distinction is the small development of the postero-internal cusp, which in *Daphænus* is as large as it is in the modern Canidæ. In the specimen under consideration the tooth is broken in such a way as not to show this postero-internal ledge very distinctly, but there can be little doubt that it was present though small.

Fig. 1. *Prodaphænus scotti* W. & M. Upper teeth, crown view, natural size. Type specimen No. 11,238, Princeton Coll.

Its technical distinction from *Uintacyon* cannot at present be given on account of our lack of knowledge of the upper teeth of this later genus. That it is a direct descendant of *Uintacyon*, and the immediate forerunner of *Daphænus*, there can be little doubt. The most striking similarity to *Daphænus* is seen in the low rounded cusps of the molars, the absence or very small development of intermediates, the reduced size of the third superior premolar, as well as the molar formula above, which is 3.

Until it can be more clearly distinguished from *Uintacyon* the genus must be regarded as provisional only, but at the same time there is little probability that the genus *Uintacyon* continued into the Uinta without change.

II.—The Ancestry of the Dholes.

Cyon, Temnocyon, Daphænus, Prodaphænus, Uintacyon.

1. *Cyon and Temnocyon.*

The Dhole or Red Dog of India (*Cyon*) can be confidently considered as the living representative of the John Day genus *Temnocyon*, and through this genus is probably descended from a

line which we can trace back with tolerable accuracy into the lower Eocene.

This important connection has been entirely overlooked by previous writers, who have considered *Temnocyon* to be an abortive side-branch of the Canidæ.

The evidence is briefly as follows :

1. Heels of lower molars trenchant. This unusual character is shared by the recent *Icticyon* and the John Day genera *Oligobunis*, *Enhydrocyon* and *Hyænocyon*. All of these have dental formulæ excluding them from the ancestry of *Cyon*.

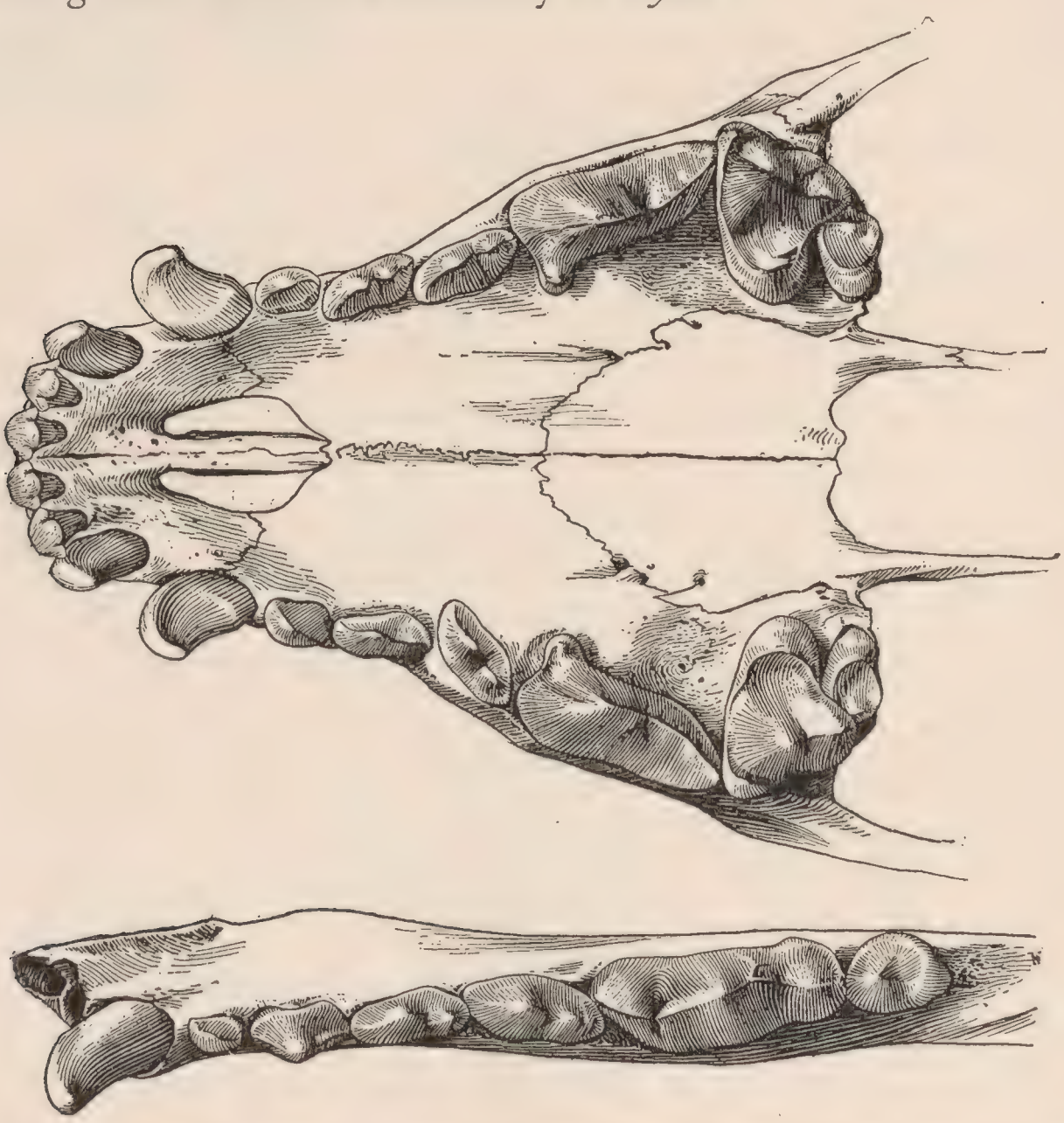


Fig. 2. *Cyon alpinus*. Upper and lower teeth, three fourths natural size. From a specimen in the American Museum collection.

2. Postero-internal cusp of superior molars reduced in *Temnocyon*, obsolete in *Cyon*, antero-internal cone reduced, separated from external cusps by an unusually deep valley, corresponding to the high trenchant heel of the lower molars.

3. Last lower molar reduced in *Temnocyon*, absent in *Cyon*. Last upper molar somewhat reduced in *Temnocyon*, considerably

so in *Cyon*. Premolars unusually large; $m^{\frac{2}{2}}$ unusually small, with internal cusp of the trigon reduced in *Temnocyon*, absent in *Cyon*. Jaw unusually deep under premolars.

The two are separated by the usual progressive characters seen in all modern Canidæ; the hallux is much reduced, mt. II falling from $\frac{1}{2}$ to $\frac{1}{5}$ the length of mt. III. The pollex suffers a similar reduction from $\frac{1}{2}$ to $\frac{1}{3}$ of mc. III. The foot is elongated and narrowed, the brain cavity increased, the skull shortened. Premolar 2 has acquired a posterior cusp in *Cyon*, lacking in *Temnocyon;* the internal cusp of the superior sectorial is more reduced in the modern species. In our skull of *Cyon alpinus* the incisors show a small basal lateral cusp. All these are acquired characters, most of them being developed in almost all species of

Fig. 3. *Temnocyon ferox* Eyerman. Upper and lower teeth, three fourths natural size. After Eyerman.

dogs. We find no acquired characters in *Temnocyon* that *Cyon* has not, nor any primitive characters in the latter that the former has not.

Cyon, with its congener *Icticyon*, retains more than any of the other dogs the primitive short legs and long body. The tail is much reduced in both genera.

2. *Related Genera.*

Related to the Dhole and *Temnocyon*, and distinguished like it by the trenchant heels to the molar cusps, are the modern *Icticyon*,

and the John Day genera *Enhydrocyon*, *Hyænocyon* and *Oligobunis*, all with a more reduced dental formula. They form the most carnivorous division of the family, approximating the Viverridæ or Felidæ, while *Nothocyon* and *Megalotis* stand at the other extreme, approximating the Procyonidæ.

3. *Daphænus and Temnocyon.*

The relationship between these two genera has been pointed out by Prof. Scott[1] and Dr. Eyerman.[2] All our evidence tends to confirm the view that *Temnocyon* is a descendant of *Daphænus*, although the gap between them is in some respects considerable. Both have the same strong, round-edged, massive cusps, but in *Daphænus* the molars are large and low, while in *Temnocyon* they are small and high-cusped. *Daphænus* is just beginning to develop a trenchant heel on $m \frac{1-2}{}$; it has the same deep jaw, and does not show any intermediates on the upper molars.

Hypotemnodon has a somewhat problematic position intermediate between *Cynodictis* and *Daphænus* in most of the skull characters but with trenchant heel on m_{1} only. Scott derives it from *Daphænus;* there is, however, a species of *Cynodictis* in the upper White River, which presents a closer approximation in character of teeth, and if our association of specimens is correct, has developed a low trenchant heel on m_{1} only. For this reason it is placed provisionally in the *Cynodictis* line.

Prof. Scott derives *Cynodesmus* also from *Daphænus*, basing the derivation apparently on the presence of frontal sinuses in both. Whether the presence of these in the larger species of Canidæ is of much phylogenetic value seems uncertain; on other grounds *Cynodesmus* might well be connected with *Cynodictis.*

4. *Prodaphænus and Daphænus.*

5. *Uintacyon and Prodaphænus.*

These have already been considered.

III.—The Eocene Ancestors of Cynodictis.

Vulpavus palustris[3] *Marsh.*

With this species we come to consider the phylum which in all probability terminated in the modern genus *Canis.* Its oldest

[1] Notes on the Canidæ of the White River Oligocene. Trans. Am. Phil. Soc. 1898.
[2] Amer. Geol. 1896.
[3] Amer. Jour. Sci. Aug. 1871, (p. 16 of separate).

known representative comes from the Wind River beds, and is known from only an imperfect fragment of a lower jaw in the Museum collection. In the Bridger the genus is represented by at least two species, one of which, *V. palustris*, was described by Marsh from a single superior molar and forms the basis of the genus; and the other, *V. parvivorus*, was described from a fragment of a lower jaw by Cope and made the type of his genus *Miacis*. In the Museum collection is a specimen which upon careful comparison with Marsh's type of *V. palustris* we identify with this species; it consists of two superior molars of the right side, two nearly complete mandibular rami, together with some fragments of the skeleton of the limbs (No. 2305). It was found by Mr. O. A. Peterson of the Museum party of 1895, and was obtained from the middle horizon near the extreme southern limits of the Washakie Basin.

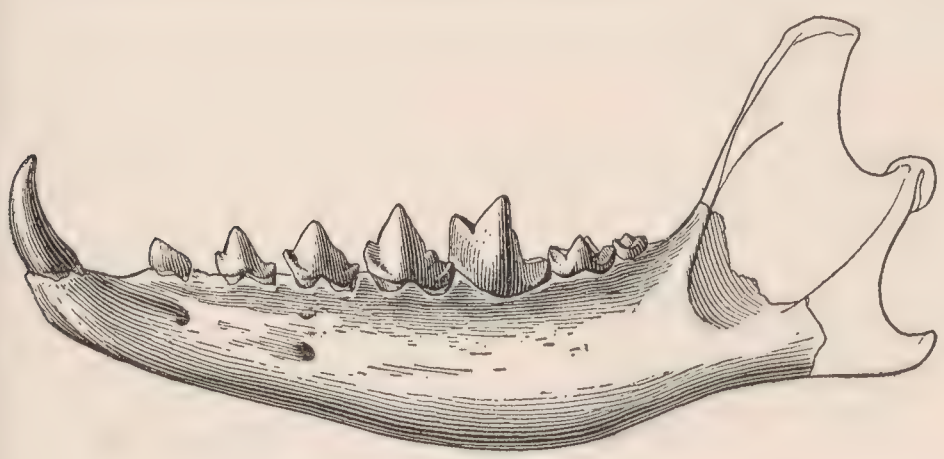


Fig. 4. *Vulpavus palustris* Marsh. Lower jaw, natural size. No. 2305.

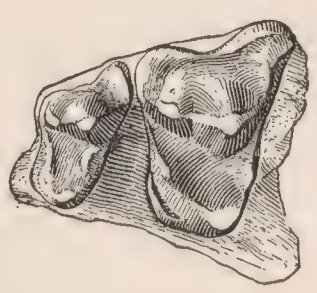


Fig. 5. *Vulpavus palustris* Marsh. Upper teeth, twice natural size. No. 2305.

The superior molars are two in number and display about the same proportions as those of many of the existing Canidæ. They present a number of features, however, very different from the modern Dogs. The first molar is remarkable for the great elongation of its anterior side in comparison with the posterior, and the drawing out of the antero-external angle, as well as the unusually broad ledge intervening between the base of the external cusps and the outer border of the crown. Another marked feature of this tooth is the great disparity in size between the anterior external and the posterior external cusps. The antero-internal cusp is large and lunate and there is a distinct anterior and posterior intermediate. The postero-internal cusp is represented by a strong cingulum in the usual position but it does not rise up into a distinct cusp as in the later Canidæ. The second molar is similar

except that there is no representative of the postero-internal cusp. The general appearance of these teeth is more like that of many Creodonts than that of the modern Carnivora.

The lower jaw is very dog-like in its general proportions; the symphysial region is slender and the ramus is elongated. The teeth resemble those of the early Dogs, especially *Cynodictis;* the canine is long and pointed, being separated from the anterior premolar by a short diastema. The premolars have the usual form in the Canidæ, with compressed pointed crowns and basal cingula; the fourth has a distinct posterior accessory cusp. The sectorial closely resembles that of *Cynodictis.* The anterior and external cusps of the trigon form an effective shearing blade; the internal cusp is large and the heel basin-shaped. The second molar is similar in structure but its cusps are lower and there is no distinctive blade-like shear produced by a union of any of the cusps of the trigon. The last molar is much reduced, as in the later Canidæ.

Some fragments of the limb bones are preserved and they indicate, as do the teeth, a clear affinity with the early Dogs. The distal end of the radius is present, but the facet is cup-shaped

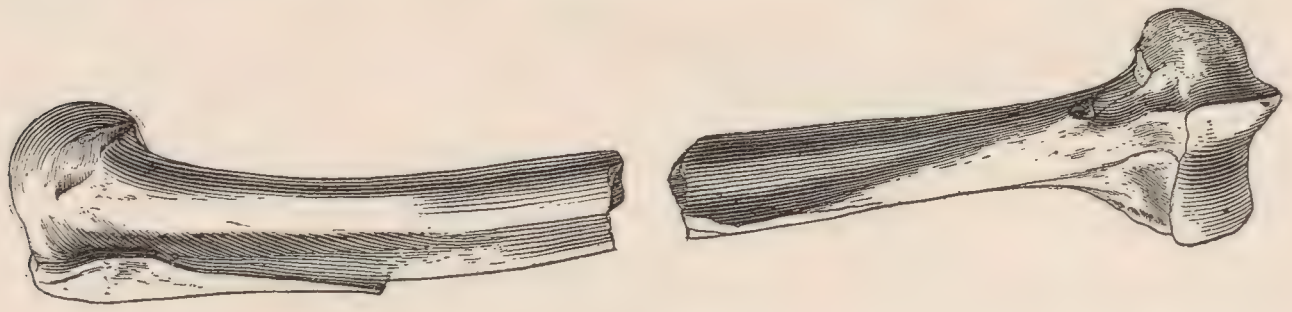


Fig 6. *Vulpavus palustris* Marsh. Humerus, natural size. No. 2305.

and exhibits no distinct ridge separating scaphoid and lunar facets. This is not, however, conclusive proof that the scaphoid and lunar were not separate, since in *Viverravus*, *Oxyæna*, and other Creodonts in which these bones are distinct, the distal end of the radius gives little or no indication of the facet.

Vulpavus parvivorus [1] (*Cope*).

This second species is represented in the collection by a fragment of a lower jaw from the Bridger of Wyoming, and has been figured by Cope as the type of his genus *Miacis.* The fragment

[1] Proc. Amer. Philos. Soc. Aug. 1872, 470.

carries the second molar in an excellent state of preservation, and exhibits the alveolus for the last molar and a portion of that of the first. The species can be readily distinguished from *V. palustris* by its smaller size and the less laterally compressed character of the second molar.

Procynodictis vulpiceps, gen. et. sp. nov.

This genus is proposed upon two specimens in the Museum collection, one of which (No. 2514) includes one upper and both lower jaws, together with the greater part of a hind foot, and the other (No. 2506) includes a part of the skull and the greater portion of the right fore foot. Besides these there are two fragments of jaws (Nos. 1895 and 1995) which we refer to the same species.

The dental formula is the same as in *Vulpavus* and *Cynodictis*, there being but two true molars above, and the systematic position of the genus is entirely intermediate between these two. In the structure of the superior molars it agrees with *Vulpavus* in that there is a great extension of the antero-external part of the

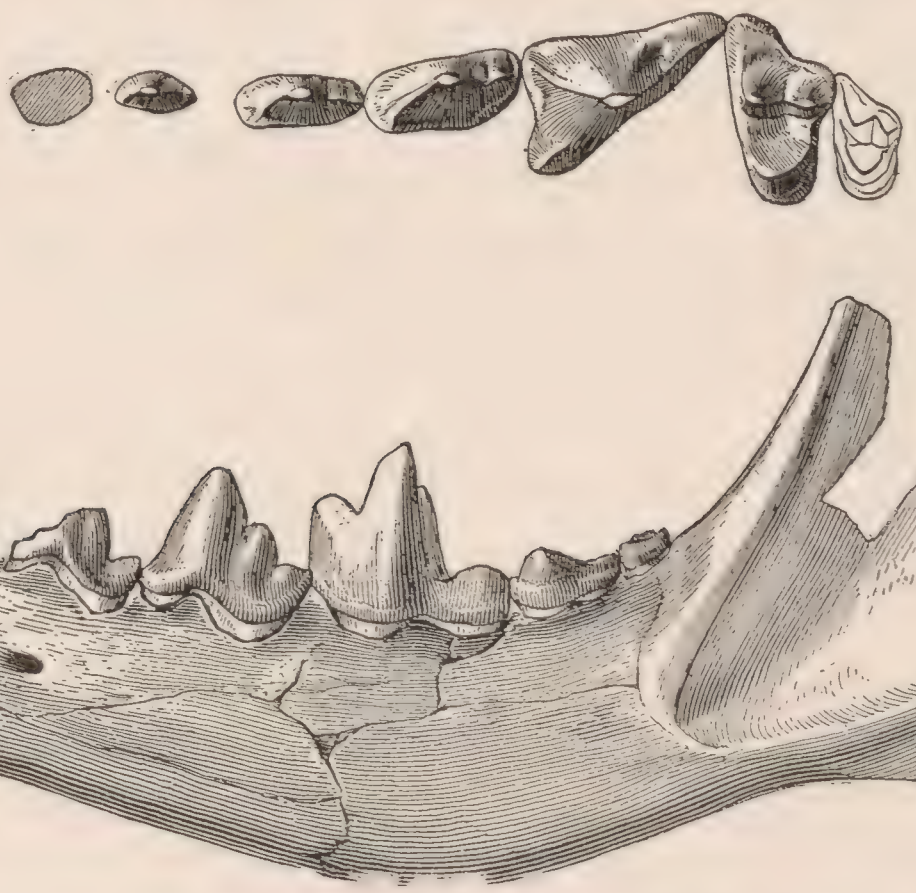


Fig. 7. *Procynodictis vulpiceps* W. & M. Upper and lower teeth, three halves natural size. Type specimen No. 2514.

tooth and a comparatively small development of the postero-internal cusp. In *Cynodictis* this cusp is as well developed relatively as in the modern Dogs, but the great antero-external extension is

lacking. The only important character in which it differs from *Vulpavus* is seen in the nearly equal size of the two external cusps of the first superior molar, whereas in *Vulpavus* the anterior greatly exceeds the posterior in size. This at first sight would seem to be of little significance, but the primitive condition was undoubtedly the one displayed by *Vulpavus*, and the more advanced one that of *Procynodictis* and *Cynodictis*. It therefore represents a distinct advance. The other teeth are very similar in their structure to those of *Vulpavus* and need no special mention.

The hind foot contains five toes; the metapodials are shorter and somewhat heavier than in *Cynodictis*, in which the hind foot had already begun to assume the elongated form so characteristic of the modern Canidæ. The tarsal bones are very like those of *Cynodictis*, as are also the remainder of the podial elements. The claws are much compressed laterally, with heavy subungual processes, and the middle phalanges are unsymmetrical, indicating some degree of retractility of the claw.

The fore foot also contains five toes, but, as in *Cynodictis*, it is much shorter than in any of the modern Canidæ. The scaphoid, lunar, and centrale are completely co-ossified as in the modern Dogs, without any trace of suture, into a scapholunar, which differs from that of *Cynodictis*, according to Scott's figure, in the greater vertical depth anteriorly, which is again a more primitive condition. The other carpals have practically the same proportions as in *Cynodictis*. The fore foot of *Vulpavus* is unknown, but it is more than probable that the scaphoid and lunar were separate in that genus, which if true will constitute an important difference between it and the present genus.

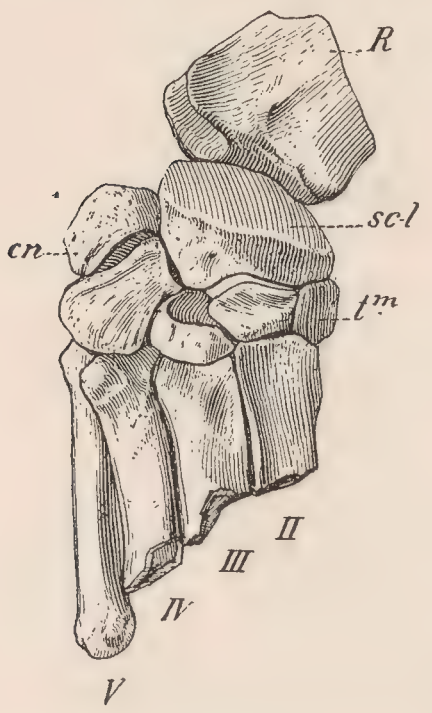


Fig. 8. *Procynodictis vulpiceps* W. & M. Fore foot, three halves natural size. No. 2506.

IV.—Notes on a Skeleton of Cynodictis gregarius.

In the American Museum Collection, Expedition of 1898, is a nearly complete and very well-preserved skeleton of *Cynodictis*

gregarius (No. 8774). Prof. Scott has already fully described nearly all parts of this species, but we are able to fill out the description in one or two points for which his material was incomplete, and to give a series of measurements, which, being taken all from one individual, give the relative proportions with greater accuracy. Some of the individuals which Prof. Scott includes under *C. gregarius* may be referable to *C. lippincottianus*.

Hind Foot.—The *tarsus* has already been described in full by Prof. Scott. There are five *metatarsals*, the first slender, its length two thirds that of mt. III, diameter of the shaft half as great. Head rather small, shaft nearly straight, slender, rather compressed. Second, third, fourth, and fifth metatarsals symmetrical, the central pair a little longer and about one fourth greater in diameter of shaft. The distal articular ends are spheroidal, not at all of the square-cut style seen in all modern Dogs. The upper part of the shaft is somewhat compressed, the distal part not at all, and the distal ends are much more enlarged than in *Canis*, the diameter being one third more than that of the shaft, which in *Canis* increases in diameter at the distal end and is not over one tenth of the shaft diameter. The foot was therefore more spreading, as well as 15 per cent. shorter. The bones are as slender, however, as in a modern Dog. The phalanges are long and slender, quite as long as in modern Dogs. The second phalanx of each toe is asymmetrical and excavated, as in *Daphænus*, indicating, according to Scott, some retractility of the claws. No strong basal sheath appears to have been on the unguals, which are much as in *Canis*.

As the measurements indicate, the hind limb bones were much nearer to their present proportions, while the fore limbs were still quite short. The difference in the feet is yet more marked, for while the fore foot was scarcely more elongated than the Creodont ancestors, the hind foot was already long and slender, though not as narrow nor quite as long as in modern species. In both feet, however, the tetradactyl symmetry is already distinct, and both pollex and hallux are reduced.

The measurements of the skeleton, No. 8774, as far as at present obtainable, are given in comparison with those of the Fennec, the nearest living Canid in point of size.

Measurements of CYNODICTIS GREGARIUS (*Cope*), *in Comparison with* CANIS ZERDA.

	Cy. gregarius.	*Ca. zerda.*[1]
Skull, length, premaxillæ to condyles...	est. 76 mm.	81 mm.
" length of palate (dentition)	" 42	45
" breadth "	" 27	24
" " brain case	29	35
Vertebræ, all pre-caudals.....		291
" cervicals.....		72
" dorsals.....		113
" lumbars.....	105	90
" sacrals	23	16
" caudals.....		350
Fore limb, total length.....	180	230
" humerus.....	71	80
" radius.....	56	79
" foot.....	53	71
" carpus.....	6	est. 12
" metacarpus.....	22	28
" phalanges.....	est. 25	est. 25
Hind limb, total length.....	241	272
" femur.....	80	81
" tibia.....	81	98
" foot (astragalus to ungues)...	80	93
" tarsus.....	19	est. 22
" metatarsus	34	" 43
" phalanges.....	27	" 27

Taking the above measurements in order, we see that the skull of *Cynodictis* is shorter and with smaller brain-cavity. The neck and back vertebræ are nearly of the same size as in the Fennec, but cannot be measured at present. The lumbars and sacrum are considerably larger, and the tail was probably as long (no other living Dog has a tail of this length). The fore limb is one fourth shorter, while the hind limb is only one ninth shorter. The greater part of the elongation has been in the lower limb and foot bones. The phalanges have not lengthened at all, there being no tendency to become unguligrade.

V.—THE ANCESTRY OF CERTAIN SOUTH AMERICAN FOXES.

Nothocyon, gen. nov.

A genus or subgenus of Dogs distinguished by:

(1) Short muzzle; (2) upper carnassial very small, trigon of lower carnassial reduced, shear partly transverse; (3) molars

[1] Measurements taken from Mivart's Monograph of the Canidæ.

large, not extended transversely, subquadrate ; (4) lower carnassial broad-heeled, and with an accessory cusp at the postero-external corner of the trigon ; (5) canines slender ; (6) otic bullæ large.

Canis urostictus Mivart, and *C. parvidens* Mivart, both from South America, belong to this genus, to which we also refer provisionally the three John Day species, *latidens* Cope, *lemur* Cope, and *geismarianus* Cope. These latter seem to be directly ancestral forms, and, like all the earlier Dogs, have shorter feet, longer lumbar region, and smaller brain-case than the modern species.

The distinctions above noted may seem hardly to be of generic value ; they are, however, tolerably constant, *Urocyon cinereoargenteus* being the only intermediate type. And if the group was first separated in the Oligocene, as seems probable, it gives it an ancestry that deserves full generic recognition. The alternative to uniting the John Day and modern species is to place the one as a subgenus of *Cynodictis*, the other of *Canis ;* the present method seems, however, to recognize more clearly the actual genetic affinities ; for if the living *Canis parvidens* and *urostictus* are lineally descended from the John Day *Cynodictis latidens lemur*, and *geismarianus*, the two modern species are more nearly related to the three Miocene species than to any living Canidæ. The best way to express this fact is to remove the Miocene species from *Cynodictis*, to the typical forms of which they are not more nearly related than the half-dozen or more distinct genera of the Phosphorites of France, and to unite them with two modern species, disregarding the considerable modernization of the latter, which retain, however, an unusual amount of the Tertiary facies.

Nothocyon urostictus (*Mivart*).

Canis urostictus Mivart, Proc. Zoöl. Soc. Lond. 1890, 112 ; Monograph of the Canidæ, 81.

The type and only specimen hitherto known is in the British Museum. No. 391, Dept. Osteol., Amer. Mus. Nat. Hist., we refer to this species and figure here. In size it is not very different from *Canis azaræ*, but the size and characters of the molars and carnassial easily distinguish it. The lyrate area on top of the skull is shared by many species of Dogs. Limbs and feet about as in modern species of *Canis ;* the lumbars appear to

be larger in proportion. Locality, Chapada, Matto Grosso, Brazil.

Fig. 9. *Nothocyon urostictus* (Mivart). Skull and jaw, five sevenths natural size. No. 391.

Nothocyon parvidens (*Mivart*).

Canis parvidens MIVART, loc. cit.

The only specimens hitherto known are three in the British Museum. We are enabled to add another skeleton, No. 349,

Dept. Ost., Am. Mus. Nat. Hist., on the somewhat uncertain dental distinction separating it from *N. urostictus.* $P^{\frac{4}{4}}$ is shorter, canines not so slender, $m_{\frac{3}{3}}$ more reduced, $m^{\frac{1}{1}}$ and $m^{\frac{2}{2}}$ seem to be variable in shape. No. 2091 also belongs to this or the preceding species. Locality, Chapada, Matto Grosso, Brazil.

As another division (Primævi) of the same genus, distinguished by relatively small brain, short feet, and long lumbar region, we place the three John Day species.

Nothocyon latidens (*Cope*).

Galecynus latidens COPE, Bull. U. S. Geol. Surv. VI, 1881, 181.
Cynodictis latidens SCOTT, Trans. Amer. Phil. Soc. 1898, 400.

Distinguished by exceptionally broad upper molars. Bullæ very large.

Nothocyon lemur (*Cope*)

Galecynus lemur COPE, Bull. U. S. Geol. Surv. VI, 1881, 181.
Cynodictis lemur SCOTT, Trans. Amer. Phil. Soc. 1898, 400.

Molars narrower, cusps marginal, double entoconid on $m_{\frac{1}{1}}$, postero-external accessory cusp on $m_{\frac{2}{2}}$ doubtful. Bullæ very large.

Nothocyon geismarianus (*Cope*).

Canis geismarianus COPE, Pal. Bull. No. 30, 1879, 9.
Cynodictis geismarianus SCOTT, loc. cit.

Larger species, deuterocone of $p^{\frac{4}{4}}$ more reduced than in the others. Bullæ of more moderate size.

The skeleton of this species is fortunately known and has been described by Cope. It stands intermediate between that of *Cynodictis gregarius* and that of *Nothocyon urostictus.* The following comparisons show the advance in the especially progressive characters of (1) length of feet, (2) length of lumbar region, (3) size of brain.

Cynodictis gregarius, width of carpus, 15 mm.; length of mc. III, 22 mm.; proportion, 1 : 1.5.

Nothocyon geismarianus, width of carpus, 16.5 mm.; length of met. III, 33 mm.; proportion, 1 : 2.

Nothocyon urostictus, width of carpus, 18 mm.; length of mc. III, 48 mm.; proportion, 1 : 2.7.

In the same species we have :

Cynodictis gregarius, length of skull, 76 mm.; width of brain-case, 29, height, 22, length, 43 mm.; proportion of length of skull to width of brain-case, 1 : 0.37; length of seven lumbars, 104; proportion of length of skull to that of lumbar vertebræ, 1 : 1.37.

Nothocyon geismarianus, length of skull, 111 mm.; width of brain-case, 40, height, 33, length, 52 mm.; proportion of length of skull to width of brain-case, 1 : 0.37; length of seven lumbars, 155; proportion of length of skull to that of lumbar vertebræ, 1 : 1.39.

Nothocyon urostictus, length of skull, 112 mm.; width of brain-case, 45, height, 35, length, 52 mm.; proportion of length of skull to width of brain-case, 1 : 0.41; length of seven lumbars, 129; proportion of length of skull to that of lumbar vertebræ, 1 : 1.15.

From the above proportions it appears that the John Day species exhibits an important advance on the White River *Cynodictis* in the increase in length of feet and decrease in their width. The increase in the size and robustness of the species marks the advance in brain capacity, and the lumbar region has not suffered any proportionate reduction. In the modern species there is a further increase in length of feet, the brain increases in capacity, and the lumbar region is greatly reduced. The length of the femur and humerus does not increase in proportion; that of the tibia increases slightly and of the radius considerably.

	C. gregarius.	*N. geismarianus.*	*N. urostictus.*	Proportions, length of skull as unity.
Length humerus..	71	98	106	.93 : .90 : .94
" radius....	55	?	105	.72 : ? : .94
" femur....	79	110	116	1.03 : 1.00 : 1.04
" tibia.....	80	116	120	1.04 : 1.04 : 1.07

The above measurements are from the complete skeletons of *C. gregarius* (No. 8774), *N. geismarianus* (No. 6886), *N. urostictus* (No. 391, Dept. Ost.).

The longer-legged specimens referred by Prof. Scott to *C. gregarius* may be referable to *C. lippincottianus.* These have the limbs, especially the tibia and fibula, much longer than in *C. gregarius* proper, but the feet apparently of the same size.

VI.—Analysis of the Miocene Genera of Canidæ.

It is doubtful whether some of these genera should rank as such, the distinctions being probably of only subgeneric value. They certainly represent well-defined groups, and it would be difficult to invalidate one without invalidating nearly all. The mere *number* of the teeth cannot be considered as a more im-

portant character than their form, and unless certain characters are arbitrarily selected as generic, the representation of natural groups is the only valid foundation for generic distinctness. As a mere matter of convenience, the groups are here used as genera, with the proviso that they are not all of generic value. *Phlaocyon* stands widely apart from the rest, as does also *Oligobunis;* but whether two, three, or several genera are made out of the remaining species is a matter of arbitrary selection rather than natural grouping.

I. Procyonidæ.

Skull short and wide, orbits well forward; carnassial teeth imperfectly or not sectorial; a hypocone on $p^{\frac{4}{}}$. Pentadactyl, plantigrade. Dentition typically $\frac{3-1-4-2}{3-1-4-2}$.

A. Third lower molar absent, second elongated. Modern genera *Bassariscus*, *Procyon*, *Bassaricyon*, *Nasua*, *Cercoleptes*.

B. Third lower molar present, second not elongated.

Phlaocyon. Dentition $\frac{3-1-4-2}{3-1-4-3}$.

II. Canidæ.

Becoming tetradactyl, digitigrade. Skull long, orbits not advanced, teeth sectorial and tubercular.

A. Short-footed, pentadactyl, with shear of sectorial partly transverse, small brain and other primitive characters.

1. Dental formula $\frac{3-1-4-3}{3-1-4-3}$.

a. *Daphænus* Leidy. Upper molars transversely unsymmetrical (paracone more external than metacone). $M^{\frac{3}{}}$ oval, aligned with inner cusps of anterior molars. Heels of lower molars low-ridged, with low entoconid crest, $m_{\overline{3}}$ a convex nub.

D. vetus Leidy. Amer. Mus., Nos. 1388, 1390.

D. hartshornianus (Cope). Amer. Mus., Nos. 6811, 1387.

D. felina Scott.

D. dolgei Scott.

The first three species are from the Oreodon beds, the last from the Titanotherium beds.

b. *Paradaphænus*, gen. nov. Upper molars much extended and symmetrical transversely; $m^{\frac{3}{}}$ aligned with outer cusps of anterior molars. Heels of lower molars wide and deep, basin-shaped; $m_{\overline{2}}$ and $m_{\overline{3}}$ with two anterior cusps and basin-heel.

P. cuspigerus (Cope). Nos. 6852 (type), and probably 6853 (type of *Amphicyon entoptychi* Cope).

P. transversus, n. sp.

Size one third larger (lineal). Upper premolars compressed.
Type No. 6851 (referred to *Amphicyon hartshornianus* by Cope).
Both species are from the John Day.

2. Dental formula $\frac{3-1-4-2}{3-1-4-3}$.

a. Temnocyon Cope. Heels of lower molars trenchant, without internal ridge. Trigon of $m_{\overline{2}}$ trenchant, without internal cusp.

T. altigenis Cope. Nos. 6855 (type), 6856.

T. wallovianus Cope. No. 6858 (type).

T. ferox Eyerman. No. 6857.

b. Hypotemnodon Eyerman. Heels of lower molars trenchant, internal ridge vestigial or wanting. Trigon of $m_{\overline{2}}$ with $pr_{\cdot}^{d}$ and $me_{\cdot}^{d}$ of equal size.

H. coryphæus (Cope). Nos. 6859 (type), 6860, 6862, 6922, and doubtfully Nos. 6861, 6920, 6909, etc.

H. josephi (Cope). Nos. 6878 (type), 6863, 6908, 6921.

All from the John Day.

c. Cynodictis Brav. and Pom. Heels of lower molars basin-shaped. Upper molars extended transversely. The American species are:

C. gregarius (Cope). Nos. 5297 (type), 5298, 5299 (fig. sp.), 1004, 1383, 1472, 8774, 5300. No. 6879 is probably a distinct species but does not present any well-marked specific characters.

C. lippincottianus (Cope). Nos. 5327 (type), 8757–63, 1384, 1389, etc. Teeth one fifth greater in lineal dimensions, somewhat more robust. Sectorial proportionately larger, shear less transverse.

? C. temnodon, n. sp. Size of *Hypotemnodon josephi;* lower premolars smaller than in that species and trigon wider; $p^{\underline{4}}$ (in associated upper jaws) with internal cusp almost obsolete, shear rather more longitudinal than in *Cynodictis lippincottianus*, $m^{\underline{1}}$ well extended transversely.

C. gregarius and *C. lippincottianus* come from the Oreodon beds (except the one skull No. 6879, of doubtful reference, which comes from the John Day). *C. temnodon* is from the Protoceras beds.

d. Nothocyon (section Primævi). Upper molars short transversely; $p^{\underline{4}}$ small; lower molars with wide basin heels, trigon of $m_{\overline{1}}$ reduced, and a small accessory cusp at its postero-external corner.

N. latidens (Cope). Nos. 6896 (type), 6897–99.

N. lemur (Cope). Nos. 6888 (type), 6889–94.

All from the John Day.

3. *Premolars* reduced.

a. Enhydrocyon Cope. Dentition $\underline{3-1-3-2}$.

E. stenocephalus Cope. Nos. 6901 (type), 6902.

John Day.

b. Hyænocyon Cope. Dentition $\frac{3-1-3-1}{3-1-3?-1}$.

H. basilatus (Cope). No. 6904 (type).

H. sectorius (Cope). No. 6905 (type).

John Day.

4. Molars reduced.

Oligobunis Cope. Dentition $\frac{3-1-4-1}{3-1-4-2}$.

O. crassivultus (Cope). No. 6903 (type).

John Day.

B. Modernized species. Long-footed, tetradactyl (functionally), with shear of sectorials nearly longitudinal, large brains and other advanced characters.

1. Dental formula $\frac{3-1-4-3}{3-1-4-4}$. *Otocyon.*
2. Dental formula $\frac{3-1-4-2}{3-1-4-3}$. *Canis*, *Nothocyon*, *Lycaon*, *Urocyon.*
3. Dental formula $\frac{3-1-4-2}{3-1-4-2}$. *Cyon.*
4. Dental formula $\frac{3-1-4-1}{3-1-4-2}$. *Icticyon.*

VII.—An Ancestral Raccoon.

Phlaocyon leucosteus *Matthew*[1]

Founded on an exceptionally perfect skull and jaws, with a nearly complete skeleton, discovered last summer by Mr. Handel T. Martin of the American Museum Expedition of 1898 in north-eastern Colorado. The level is the uppermost beds of the White River formation, associated with *Merycochœrus*, *Anchippus*, *Leptauchenia*, *Hyracodon*, etc. The specimen was found in the rock mixed with skulls and skeletons of two adult and three young *Merycochœri*, all within a space of six feet square.

It represents a new and aberrant genus of Dogs, the characters pointing clearly in the direction of the Raccoons, so that if we adopt the genealogical conception of a family it must be placed in the Procyonidæ, although it is nearer to such primitive Dogs as *Cynodictis* than to the modern Raccoons.

Dentition.—(1) There is a small but clearly marked postero-internal cusp on the upper sectorial, which, however, (2) retains the triangular shape characteristic of the early Canidæ. (3) The dentition is that of *Cynodictis* and *Canis*, (4) but the cusps are low and rounded. (5) Premolars small, stout, and crowded; (6) upper molars short transversely and subquadrate, as in *Cynodon*, (7) the lower molars broad and low. (8) Canines short, the upper ones not dagger-shaped, but curved as in the Dogs. (9) Incisors in an even, transverse row. *Jaw* (10) short and thick, deep in

[1] Bull. Am. Mus. Nat. Hist. 1899, 54.

front, (11) condyles very wide, (12) coronoid process short and wide with deep fossa. *Skull* (13) short and wide, (14) orbits placed as far forward as in *Procyon*, (15) jugal process of squamosal not reaching as far forward as postorbital process of malar. (16) Shape and proportions of skull and jaws resemble those of *Procyon lotor*, except that (17) the brain-case is much smaller proportionately. (18) An alisphenoid canal as in *Cynodictis*. (19) A median and two lateral foramina in palate between canines. (20) Palate not extended posteriorly. (21) Base of skull much less broadened than in *Procyon*, (22) paroccipital process not developed.

Of the above Nos. 1, 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, and 19 are progressive characters in the direction of the Raccoons. Nos. 2, 3, 6, 7, 8, 17, 18, 20, 21, 22, are primitive characters, shared by all early Canidæ.

Skeleton.—The hyoid bones were found perfectly preserved, but offer few characters for distinction.

The atlas is like that of *Cynodictis ;* the posterior opening of the vertebral canal presents a little upward instead of directly upward as in recent Canidæ, or directly backward as in *Procyon*, where the opening is bounded by a strong ridge passing outward from the axial cotylus.

Concerning the other vertebræ no exact account can be given at present, as they are not yet removed from the matrix ; they resemble in most respects those of *Cynodictis*. The ribs are somewhat larger ; the dorso-lumbar formula is not yet known.

Fore Limb.—The *humerus* is of the same length as in *Procyon lotor*, but more slender throughout. The greater tuberosity is higher and the deltoid crest is more marked and extends farther down. The *radius and ulna* are 15 per cent. less in length and of about the same diameter in the shaft. Shafts of both trihedral or irregular in cross-section, instead of regularly oval as in modern Raccoons. *Carpus* with co-ossified scapholunar, thin cuneiform, large unciform, rather small magnum, rather large trapezoid, and small trapezium. Five metacarpals, of which mc. I is only half the length or diameter of III ; mc. V is three fourths as long, but of considerably greater diameter than mc. III ; mc. II and IV equal in diameter to, but a little shorter than, mc. III.

Hind Limb.—The *femur* is of nearly the same length as that of *P. lotor*, and one fifth slenderer. The shape resembles *Cynodic-*

tis ; the greater trochanter is much less prominent than in *Procyon*, the lesser trochanter more prominent, the neck longer and more slender. The distal end of the femur is only three fourths as wide as in *Procyon ;* condyles projecting more than in that animal, less than in *Canis* and *Cynodictis*.

The *tibia* is one sixth shorter than that of *P. lotor*, somewhat more slender in proportion, stouter than that of *C. gregarius* and of the same length. Its distal trochlea is narrower antero-posteriorly, deeper and more oblique than in *Procyon ;* the fibular facet also is twisted around so as to face postero-externally instead of externally as in *Procyon*. The *fibula* is somewhat less reduced, its shaft being as stout as in the Raccoon, the ends somewhat smaller.

The hind foot, though uniformly smaller, is proportioned like that of the Raccoon, with the following differences worth noting. The *astragalar trochlea* is narrower, sharper, less entended backward. The internal hook of the *navicular* is smaller. The *cuboid* is wider and has a small facet for the astragalus. The *entocuneiform* is not nearly so high. The first *metatarsal* is only two thirds as long, though somewhat stouter in proportion ; and the fifth is as long as the second, and nearly as large in the shaft ; in the Raccoon it is intermediate between mt. I and mt. II in length. The hind feet of *Phlaocyon* have thus a tetradactyl symmetry, while in *Procyon* they are intermediate between tetra- and pentadactyl symmetry. The second row of *phalanges* shows a distinction of some importance, the superior external surface of the shaft being excavated, especially toward the distal end, a character which Scott has observed in *Daphænus* and considers a probable indication of slight retractility of the claws. It is also present in *Cynodictis* and in some Creodonts, and is probably a primitive character. In the Raccoon this excavation of the second phalanx has entirely disappeared.

The *ungual* phalanges are a little larger and less compressed than those of *Procyon lotor*.

Affinities of Phlaocyon.

Plate VI.

Phlaocyon, in both skull and skeleton characters, seems to point towards *Procyon*, standing intermediate between that genus

and *Cynodictis* in almost every character. The entirely intermediate character of the skull and teeth is well shown in our drawings: especial attention should be drawn to the postero-internal cusp on $p^{\frac{4}{4}}$; short jaws with deep muzzle and round blunt premolars; broad low sectorials, with additional postero-external cusp on trigon of $m_{\frac{1}{1}}$; reduced $m_{\frac{3}{3}}$; lower incisors in a straight row. Eyes set far forward, skull short, arches wide. On the other hand the resemblance to *Cynodictis* is closer in the form and cusp-arrangement of the teeth; palate terminating opposite $m^{\frac{3}{3}}$, alisphenoid canal; occiput not so much expanded; retention of $m_{\frac{3}{3}}$; $m_{\frac{2}{2}}$ not lengthened out.

In the skeleton the same story appears. The limb bones are like those of *Cynodictis* with varying amounts of change to *Procyon*. Only in the hind foot is there any difficulty. Here the first toe is more reduced in *Phlaocyon* than in *Procyon*, which makes it seem probable that *P. leucosteus* is slightly off the line from *Procyon lotor*.

The resemblance to *Bassariscus* is even closer. But *Bassariscus* cannot be considered as the living representative of *Phlaocyon*. It shows less departure from *Cynodictis* in many characters, especially in the shape of the upper molars and lower sectorial and slender jaw; the postero-internal cusp of the upper sectorial is not developed in one species, and although it is present in the other, the tooth retains much more of its trenchant function. The loss of $m_{\frac{3}{3}}$ is an advance on *Phlaocyon;* on the other hand, the eyes are not set so far forward, nor is the muzzle so much shortened or the arches so wide. The brain is very much larger in proportion, as might be expected, but the feet are precise copies of those of *Cynodictis*.

With *Nasua* the comparison is not so close as with *Procyon*. The long skull, large dagger-shaped canines, comparatively narrow, square occiput, reduced and peculiarly shaped bullæ, carry it out of the probable line of evolution pursued by *Phlaocyon*. The limbs and feet are somewhat nearer to *Phlaocyon* in some characters; the feet have the internal toe unreduced.

Cercoleptes is much more aberrant in the skull and teeth and *Ælurus* has a different pattern of teeth. Altogether *Procyon* seems to come nearest to fulfilling the conditions required of a descendant of *Phlaocyon*.

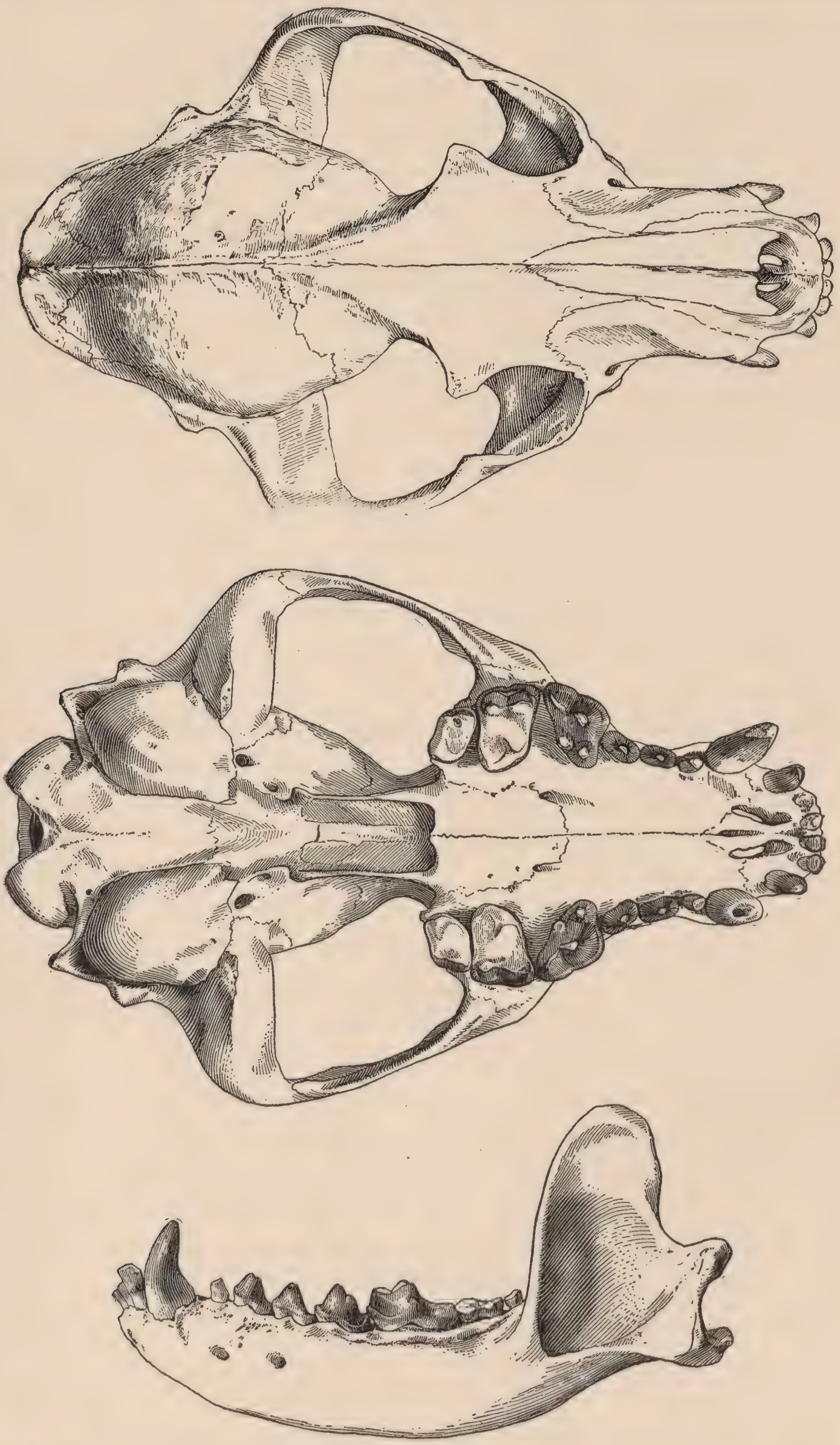


Fig. 10. *Phlaocyon leucosteus* Matthew. Skull and jaw, natural size. Type specimen No. 8768.

VIII.—VIVERRAVIDÆ, fam. nov.

This family is proposed to include the species which have been formerly arranged under the genus *Diaymictis* of Cope. That this genus is synonymous with the one previously established by Marsh, there cannot be the slightest question whatever. A careful comparison of the type of *Viverravus gracilis* Marsh,[1] with the type of *Didymictis dawkinsianus*[2] Cope, reveals the fact that they are identical in every detail; the name *Didymictis* must therefore be abandoned and the name *Viverravus* substituted for the genus.

It has been customary to associate this group of species, together with that which has been referred to *Uintacyon* (*Miacis*), in the family *Miacidæ*. We have already shown that this latter is clearly related to, and no doubt ancestral to the *Daphænus*, the *Cyon* section of the Canidæ. It is also evident from much additional material now in the Museum collections that *Viverravus* belongs to an entirely distinct line and has no relationship with the Canidæ whatever, but in so far as the skeleton can be depended upon for evidence of affinity it finds its nearest relationship with the living Viverridæ. This opinion is not a new one, having been first expressed as long ago as 1886,[3] and later in 1891.[4]

The new evidence consists of the greater part of a skeleton of *Viverravus protenus* from the Wasatch Eocene of Wyoming, together with a considerable portion of a skeleton of *V. leptomylus* from the same horizon. The skull, of which there is a fairly well-preserved example, shows many striking resemblances to the more typical Viverrines, especially *Viverricula;* it is long and narrow, with prominent overhanging occiput and high sagittal crest. The muzzle is long, the basilar portion of the skull is narrow, and the mastoid not very prominent. The tympanic bulla is not preserved, but the general conformation of this part of the skull is very Civet-like. The lower jaw is long and relatively slender, with high coronoid and prominent angle. The dental formula, as is well known, is that of the Viverridæ, and the pattern of the teeth resembles most astonishingly that of the more typical members of

[1] Amer. Jour. Sci. 1872 (p. 7 of separate).
[2] Bull. U. S. Geol. Surv. VI, 1881, 191.
[3] Wortman, Teeth of the Vertebrata, 457.
[4] Flower and Lydekker, Mammals Living and Extinct, 539.

this family. This is especially seen in the superior sectorial, in which there is a deep vertical notch separating the two halves of the blade, and a prominent anterior basal cusp, which is invariably present in the carnivorous Civets. The superior molars, moreover, have the same characteristic pattern, and the lower teeth, with the exception of some unimportant details, are very viverrine. The atlas has the same arrangements of the perforations for the vertebral artery as is found in the Civets, differing in this respect from the other known families of the Carnivora. The remaining vertebræ agree with those of the Viverridæ, and the lower end of the radius has the same characteristic triangular form in cross-section as in *Viverricula*. The feet and limbs are also very like those of the Viverrines, with the exception that the scaphoid and lunar bones of the carpus are free and not united as in the modern family.

Altogether we think it may be stated with considerable certainty that the group represents the forerunners of the Viverrine phylum whose members towards the close of the Eocene migrated to Asia. This view receives strong additional support from the fact that the typical genus *Viverra* runs backward without change into the Upper Eocene of Europe, showing a remarkable degree of persistence of structure, which also characterizes the genus *Viverravus*, passing as it does with only slight specific modifications from the Torrejon beds of New Mexico through to the Bridger.

The technical definition of the group rests upon the exclusive development of the fourth superior premolar and the first inferior molar into enlarged typical sectorials, thereby distinguishing it from all the other known Creodonts except the early members of the Canidæ. From this latter family it is distinguished by having only two molars in the lower jaw and an anterior basal cusp upon the superior sectorial. From the Viverridæ it is separated by the free condition of the scaphoid, lunar, and probably the centrale as well.

The species are numerous and range in time from the Torrejon to the Bridger.

Summary.

The principal points brought out in the foregoing paper may be briefly summarized as follows :

(1) The tracing of the *Daphænus* ancestry back into the Wasatch Eocene by way of *Prodaphænus* and *Uintacyon*, which latter has always been considered a Creodont.

(2) The establishment of the relationship of *Daphænus* to *Temnocyon*, and that of *Temnocyon* to the living genus *Cyon*.

(3) Tracing the ancestry of the *Canis-Cynodictis* line back into the Eocene through *Procynodictis* and *Vulpavus*.

(4) Some additional points in the structure of *Cynodictis*.

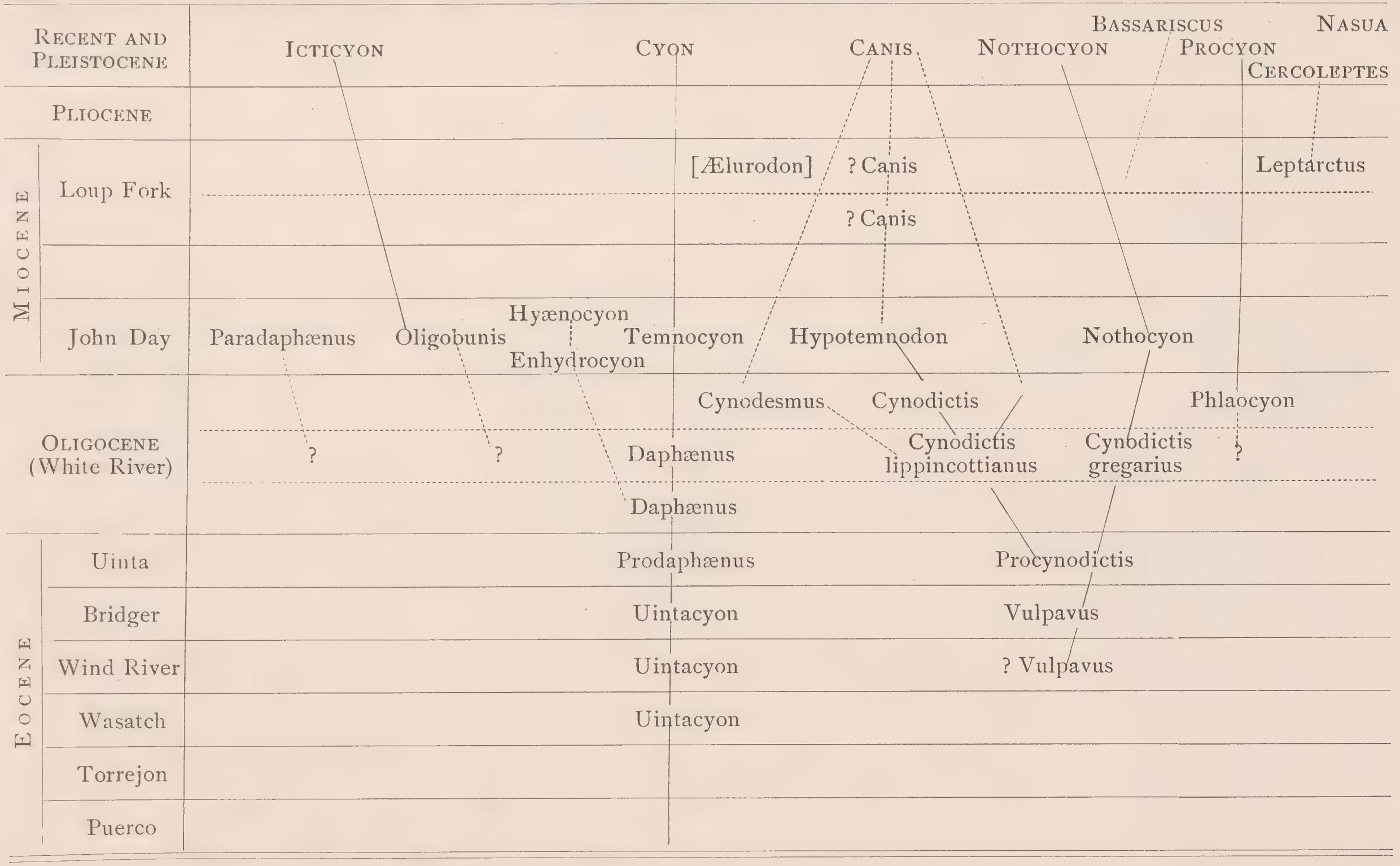
(5) The descent of certain South American Foxes from North American Miocene species, with the establishment of a new genus, *Nothocyon*, for their reception.

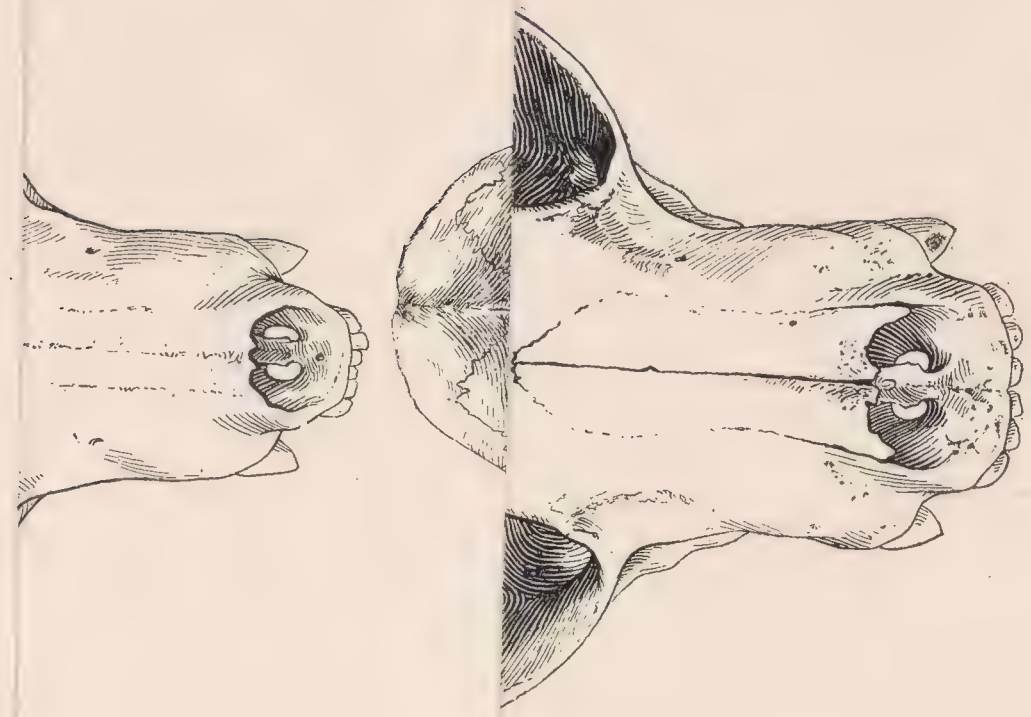
(6) Classification of the Miocene genera of the Canidæ.

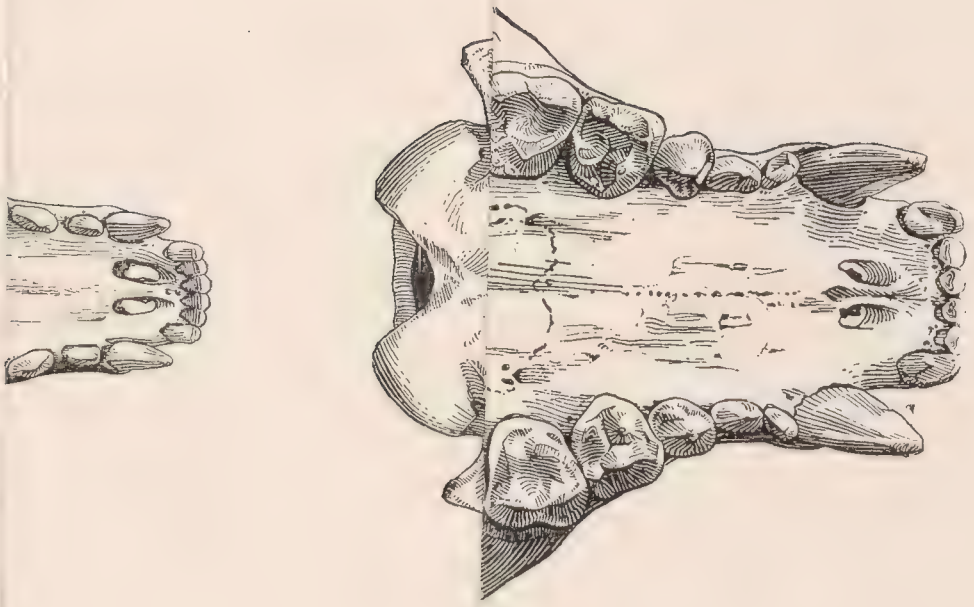
(7) The discovery of the origin of the Procyonidæ from the Canidæ through the new genus *Phlaocyon*.

(8) The discovery of the genus *Viverravus* and the establishment of a new family.

PHYLOGENETIC TABLE OF THE AMERICAN TERTIARY CANIDÆ AND PROCYONIDÆ







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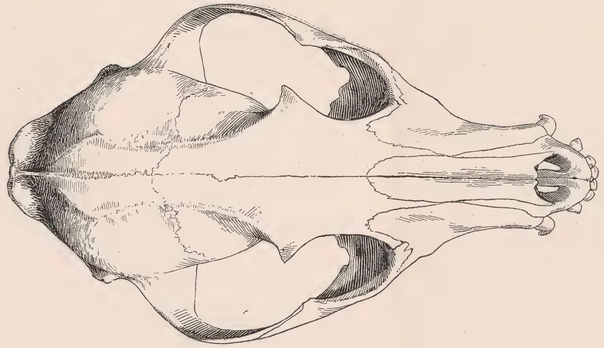
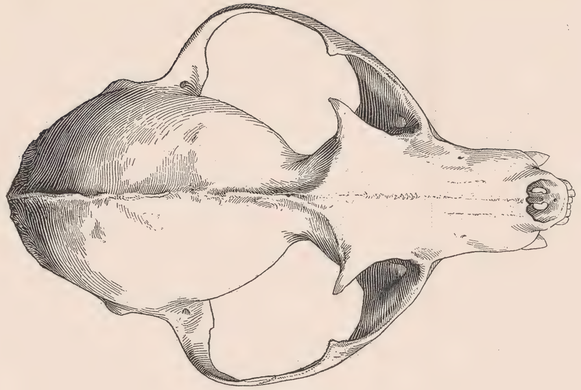
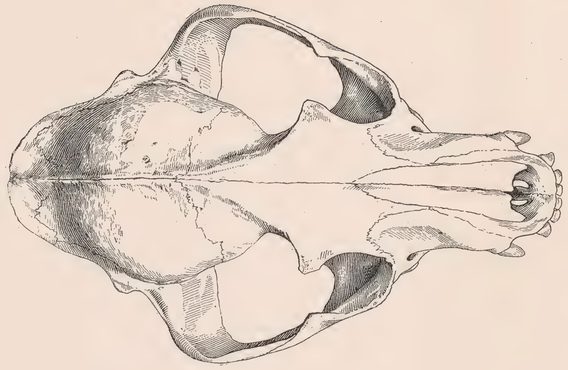
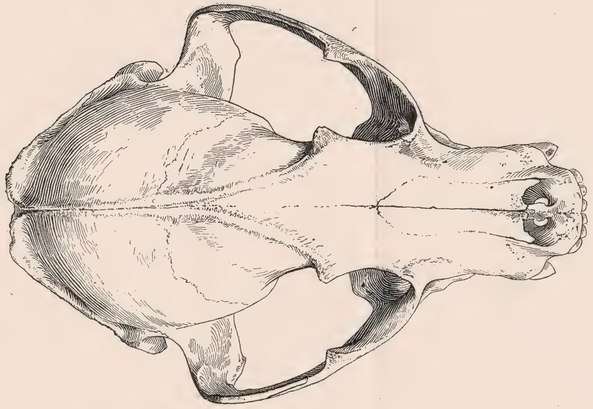
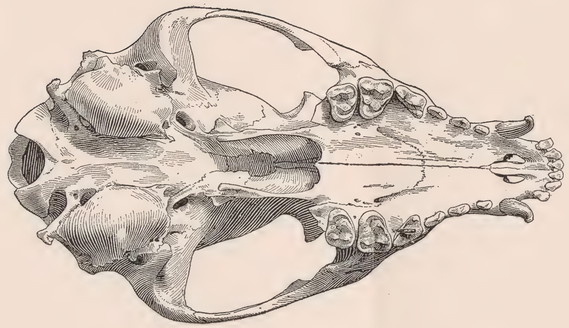


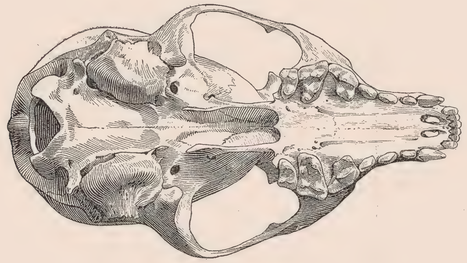


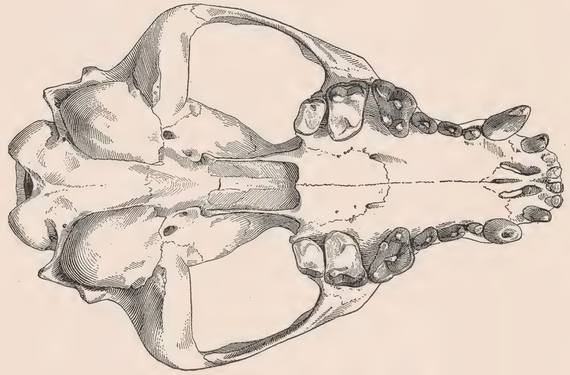
B. sumichrasti. ½.

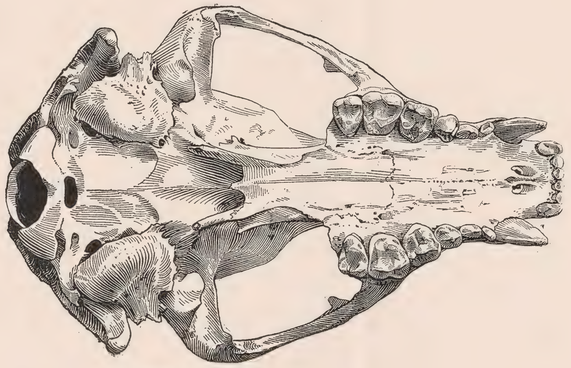


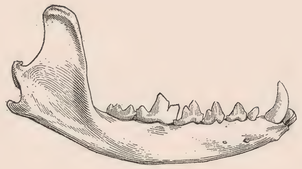












B. astuta. ½.

⅔
Nothocyon.

Bassariscus.

½
Phlaocyon.

⅔
Procyon.

Connecting Links between the Canidæ and Procyonidæ.

Article VII.—RESTORATION OF OXYÆNA LUPINA COPE, WITH DESCRIPTIONS OF CERTAIN NEW SPECIES OF EOCENE CREODONTS.

By J. L. Wortman.

Plate VII and Three Text Figures.

Family OXYÆNIDÆ.

This family of the Creodonta was the most specialized in certain ways of any of the primitive flesh-eaters of Eocene times, and apparently occupied the same position with reference to the remainder of the fauna that the modern Felidæ do to the existing fauna. In the matter of dental equipment it is surprising to find that even as early as the Wasatch this family had developed a sectorial dentition almost if not quite as effective as that of the modern Cats. In other respects, however, they were far inferior; this is particularly seen in the small brain capacity, as well as the comparatively smaller, decidedly weaker limbs with shorter, more spreading feet, provided with flatter, fissured, non-retractile claws.

The origin of the family is completely unknown at the present. They begin with several species abruptly in the Wasatch deposits of both the San Juan and Big Horn beds without any known predecessors in the underlying Torrejon. For this reason there can be very little doubt that they represent migrants from another region, probably northern Asia, which came with the Coryphodonts, Artiodactyles, Perissodactyles, Primitive Dogs, as well as many other types whose existence begins so abruptly in the Wasatch beds of North America.

According to our present knowledge the family represents a perfectly natural grouping of the known species, and is easily distinguished from the other groups of typical Creodonts that had developed a more or less perfect sectorial dentition. A convenient distinction of these families may be made upon the enlargement of a special molar in the lower jaw; it is as follows:

1. Third lower molar enlarged,—Hyænodontidæ. Includes the genera *Palæosinopa*, *Sinopa*, *Proviverra*, *Cynohyænodon*, *Pterodon*, *Hyænodon*.

2. Second lower molar enlarged,—OXYÆNIDÆ. Includes the genera *Oxyæna*, *Patriofelis*, *Oxyænodon*.

3. First lower molar enlarged,—PALÆONICTIDÆ. Includes the genera *Palæonictis*, *Amblyctonus*, *Ælurotherium*.

Oxyæna lupina *Cope*.

By a fortunate circumstance I am now enabled to give a rather full account of the skeleton of this species, which has hitherto been only imperfectly known. At the time of my first trip into the Big Horn Basin in 1880 the country was a wild, uninhabited region, save for the occasional visits of roving bands of hostile Indians, and any explorations there by a small party were attended by no small amount of risk to one's personal safety. In fact, I was advised by the commander of Fort Washakie, at that time the base of our operations, that the trip was a hazardous one, and that he would not undertake to answer for our safe conduct. We went through, however, without serious inconvenience, but at the same time the collecting was not as thoroughly done as it probably would have been under less trying circumstances.

On this expedition, among other things, I secured a part of the skeleton of this species, which was erroneously referred to Cope's somewhat larger but closely allied species *O. forcipita*, in his volume 'Tertiary Vertebrata.' In 1891, I conducted another expedition into this same region for the American Museum, at which time, through a general settlement of the country, the former more hazardous conditions had been entirely removed and undertakings of this sort were not accompanied by the same risks of violence at the hands of savage Indians as formerly prevailed. Our knowledge of methods of collecting had, moreover, materially increased, and while the actual number of specimens secured was perhaps less, yet a somewhat greater success attended our efforts, especially in securing those parts which had already been washed out of the matrix in which they had been originally imbedded. In this category comes the present specimen, a portion of which had been collected by the expedition of 1880, and the remainder by the expedition of 1891.

During this latter expedition, a new method was employed for securing the missing parts which had been washed out and covered up again by the accumulating debris. Wherever possible

the loose dirt containing the fragments was gathered up and transferred to the nearest stream where it was washed out after the manner of the placer miner. In this way, wherever conditions were favorable, all the fragments were recovered, but in the case of the present skeleton, after every possible exertion, a large number of pieces necessary to complete the skeleton remained missing. When the Cope collection was purchased by the Museum and the two collections were brought together it was accidentally discovered by Dr. Matthew that the specimen of the Cope collection furnished the missing parts of one and the same individual of the Museum specimen collected in 1891 ; in this way an unusually complete skeleton for an Eocene fossil results and furnishes all the more important characters.

Skull.—All the details of the form of the skull cannot be accurately made out owing to the great amount of crushing and fracture which the specimen had sustained during the process of

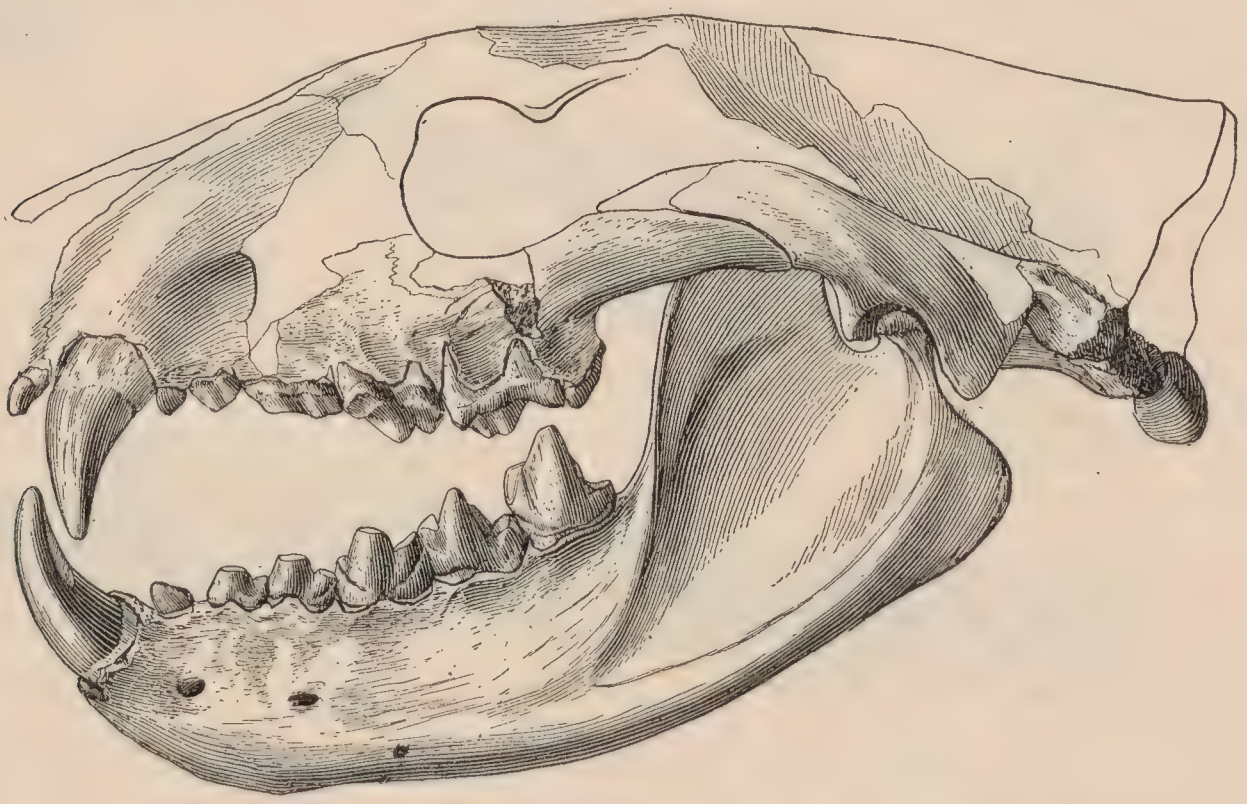


Fig. 1. *Oxyæna lupina* Cope. Skull and jaws, 3/8 natural size. No. 107.

fossilization ; but enough is preserved in an uninjured condition to indicate that the facial portion was very short and broad in proportion to the total length of the cranium. That part of the skull posterior to the orbits is proportionately much elongated and, owing to the small size of the brain-case, it appears to be unusually so. The sagittal crest is prominent and extended well forward ; the zygomatic arches are wide and heavy, and the glenoid cavity has a distinct pre- and post-glenoid process. The

mastoid is prominent, and the paroccipital process has a more or less backward direction. The foramina of the base of the skull cannot be determined, but it appears probable that there was a distinct post-glenoid present.

The dentition, the formula of which is I. $\frac{3}{3}$, C. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{2}{2}$, has been quite fully described and requires but a brief mention. It appears from the very perfect lower jaws that there were *three* incisors present upon each side, although this is not entirely demonstrable. In the upper jaw, the outer incisors are much larger than the two inner pairs, which are subequal. The canines are long and pointed, being slightly compressed at the base. The first premolar is small, single-rooted, and has a simple crown. The second is two-rooted and has a prominent posterior heel. The third is three-rooted with two external and one internal cusp. The fourth premolar, while possessing all the elements of

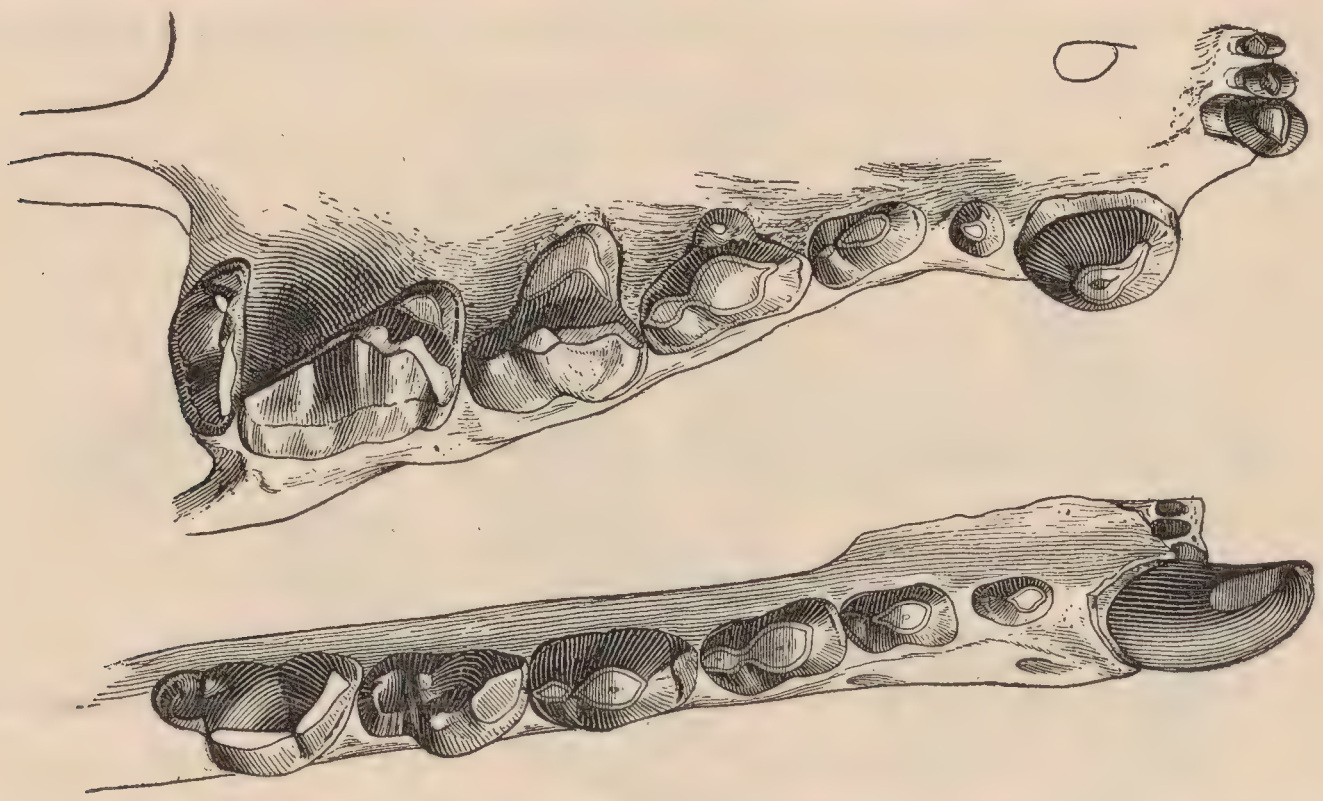


Fig. 2. *Oxyæna lupina* Cope. Upper and lower teeth, ¾ natural size. No. 107.

the superior sectorial of the typical Carnivora does not form a very perfect shear between the rudimental blade and that of the inferior first molar. The great shearing function was transferred to the first molar above and the second molar below; the first superior molar is curiously modified, in that the two original external cusps are placed very close together, and a large postero-external cusp added, which, in conjunction with the true postero-external cusp, form a very effective blade, the internal cusp being small. This is, at least, the interpretation which has

been placed upon the structure of this tooth, and the evidence in favor of such a view is found in the gradual assumption of a similar if not identical structure seen in *Hyænodon* from the more generalized pattern of the tooth exhibited by *Sinopa*. The last molar is transverse, and its crown consists of a single external cusp, with a great extension of the antero-external angle, together with a low, smaller internal cusp.

In the lower jaw the first premolar is small, the succeeding teeth gradually increasing in size to the last molar. Premolars two, three, and four have prominent heels, and the fourth has a small anterior basal cusp in addition. The molars have the typical sectorial pattern, with elevated trigon and a low, relatively small, basin-shaped heel. The internal cusp and heel are reduced in the last molar, foreshadowing its almost complete loss in *Patriofelis*.

Vertebræ.—The usual seven cervicals are present which, so far as the imperfect state of their preservation will permit one to judge, resemble closely those of *Patriofelis*. The atlas has rather wide, roomy cotyles for articulation with the occipital condyles and the transverse processes are perforated at the base quite as in *Patriofelis* and the modern Cats. The axis has a peg-like odontoid, a prominent inferior tubercle on the inferior posterior surface of the centrum, and distinct transverse processes, which are perforated at the base for the passage of the vertebral artery.

The spine is not preserved. The remaining cervicals have rather flattened centra and resemble those of *Patriofelis*.

The dorso-lumbar formula is 20, of which 13 are dorsals and 7 are lumbars. They increase in size gradually from before backwards, the posterior lumbars being the largest. The lumbar articulations are not so complex as those of *Patriofelis*, the convex postzygapophyses fitting into concave prezygapophyses with no evidence of the double, concavo-convex arrangement of certain of the other Creodonts. There are distinct anapophyses, but no metapophyses appear to have been developed. The sacrum is not preserved. Of the caudals enough are preserved to indicate that there was a long and powerful tail. The vertebræ resemble those of *Patriofelis* in all their details of structure.

Fore Limb.—Very little of the scapula is preserved, only the proximal portion of both bones being present. The glenoid cavity

has an oval form; the coracoid is prominent, and the relatively strong spine arises a short distance behind the glenoid border. There is evidence of a well developed acromion and metacromion, about as in *Patriofelis*. The humerus, like that of many of the Creodonts, has a powerful deltoid crest which occupies somewhat more than one half the entire length of the shaft. The head is pyriform, the tuberosities well developed, and the bicipital groove is deep. Distally the bone is broad, as in many of the modern Carnivores, especially the felines. There is a very prominent internal condyle; an entepicondylar foramen, and a somewhat reduced supinator ridge. The articular surface is very much as in the Cats. The ulna has a very prominent incurved olecranon, the shaft is straight, and the two distal articular facets are well separated as in the Cats. The head of the radius presents an oval outline with an unusually prominent tubercle. The lower end of the shaft is triangular in cross-section, and the scapholunar facet is concave. The fore foot has already been fully described,[1] and there is little of importance to add. The foot is relatively broad and spreading as in *Patriofelis;* the scaphoid, lunar, and centrale are free; the first phalanx of the thumb is relatively large, and all the claws are deeply fissured with the possible exception of the fifth. There is reason to believe that the habitual position of the foot was digitigrade, but there is no evidence of any retractility of the claws.

Hind Limb.—The pelvis is not very well preserved but enough is present to indicate that it was very similar to that of *Patriofelis*. The femur has a well-rounded head, a nearly straight shaft, and a small though distinct third trochanter. The tibia equals the humerus in length and has a slightly curved shaft; the cnemial crest is prominent, the internal malleolus is unusually thick and heavy, and the distal trochlea is directed obliquely inwards and is little excavated. The fibula is complete and comparatively little reduced. The hind foot is more slender than the fore foot. The tibial facet of the astragalus is but slightly grooved; the astragalar foramen is distinct, and the head of the bone is flattened from before backward, rounded and oblique; it articulates with both cuboid and navicular. The

[1] 'Fossil Mammals of the Wasatch and Wind River Beds.' Bull. Amer. Mus. Nat. Hist., Vol. IV, 1892, p. 108.

three cuneiforms have about the same relationship and arrangement as in the modern Cats. Of the metapodials there is a distinct interlocking, although the degree is much less than in the Felidæ. The third is the longest but the second is slightly the heaviest of the series. As in the fore foot, the claws are fissured and non-retractile.

Oxyænodon dysodus, gen. et sp. nov.

This genus is founded upon an unusually perfect half of a skull from the Uinta Eocene, collected by the writer in 1896. It indicates an animal of the size of a Gray Fox and is, therefore, if properly referred to the Oxyænidæ, the smallest member known. The dental formula is the same as that of *Oxyæna*, viz. : I. $\frac{3}{3}$, C. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{2}{2}$, and the last superior molar is, moreover, transverse. The chief distinctions between the two are seen in the form of the skull and the character of the premolars, as well as the great enlargement of the symphysis in the Uinta genus. In *Oxyænodon* all the lower premolars are simple and have only rudimental posterior heels, whereas in *Oxyæna* the heels of the

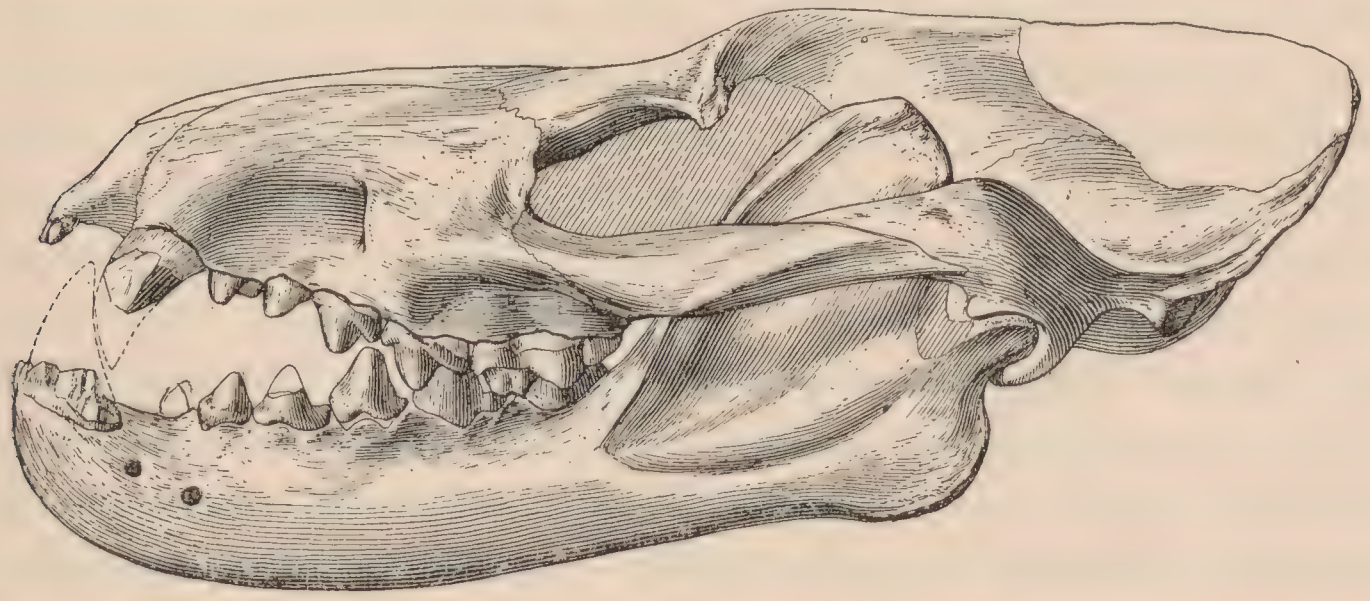


Fig. 3. *Oxyænodon dysodus.* Skull and jaw ¾th natural size. Type specimen, No. 2515.

second, third, and fourth are large, and form important elements of the crown. In *Oxyænodon* the third superior premolar has no internal cusp, while in *Oxyæna* a well developed inner cusp is present. The heel of the last lower, as well as the internal cusp of the trigon, are more reduced in the Uinta genus than in *Oxyæna*. In *Oxyænodon* the mandibular symphysis is enlarged and extends back under the third premolar, the lower jaw being relatively shallow and thick, while in *Oxyæna* the mandibular

symphysis is of much less extent and the jaw is deeper. The facial portion of the skull in *Oxyænodon* is longer.

I have suggested [1] that this family has some affinities with the Seals. The skull *Oxyænodon* strengthens this view in certain particulars. The most important resemblances to the Sea Lion are seen in (1) the great postorbital construction of the skull; (2) the pressure of a distinct lachrymal tubercle; (3) the exclusion of the frontal from any share in the anterior boundary of the orbit; (4) early union of lachrymal with maxillary; (5) forward extension of sagittal crest; (6) absence of anterior process of frontal between nasal and maxillary, and (7) an elongated mandibular symphysis. While the skull is not strikingly seal-like in its general appearance yet when we know the immediate ancestors of such a form as the Sea Lion it will not be surprising if it is found to connect with such a form as *Oxyænodon*.

Family MESONYCHIDÆ.

The Mesonychidæ undoubtedly represent a distinct line of the primitive Carnivora whose later representatives came to be characterized by elongated and specialized limbs for a running habit, as well as by a peculiar reduction and simplification of certain cusps of the molar teeth. Somewhat contrary to the generally accepted arrangement of this group, I unite with them the so-called Triisodontidæ as a well marked subfamily. This latter series is the older and displays the same tendency towards the peculiar reduction and rounded, conical form of the cusps of the molars as is seen in the *Dissacus-Pachyæna-Mesonyx* line. The differences between the subfamilies are not great and, as observed by Matthew,[2] consist in the deep, heavy jaws with powerful symphysis, and the much wider, more distinctively tubercular character of the molars in the Triisodontidæ.

The single genus *Triisodon*, with three species, comes from the Puerco and is succeeded in the Torrejon by the two genera *Sarcothraustes* and *Goniacodon*. Matthew has pointed out that *Sarcothraustes antiquus* is without doubt the direct descendant of *Triisodon* and in this opinion I entirely agree. As noted by this

[1] 'Osteology of *Patriofelis*,' Bull. Amer. Mus. Nat. Hist., Vol. IV, 1894, p. 157.
Bull. Am. Mus. Nat. Hist., Vol. IX, 1897, p. 278.

author, the same cusp reduction and simplification is observed in this succession as occurs in the *Dissacus-Pachyæna-Mesonyx* series.

The second subfamily, Mesonychinæ, so far as at present known, finds its oldest representatives in the Torrejon beds in the single genus *Dissacus*, with two well marked species. It is, indeed, very doubtful, if not impossible, that any of the known species of *Triisodon* can be placed ancestral to the present genus, although it is not at all improbable that some slender jawed type in the Puerco having the cusp pattern of *Triisodon* will be found to have commenced an early modification of the teeth terminating in *Dissacus*. The evidence for the view that the inferior molar pattern in this genus is a degenerative one, is found in the fact that in the succeeding Wasatch *Pachyæna* the postero-internal cusp of the trigon is still more reduced than it is in *Dissacus*, while in the Bridger *Mesonyx* it exists as the merest vestige, the cusps of all the molars at the same time assuming a very rounded and characteristic conical form.

Pachyæna intermedia, sp. nov.

It has been shown by Osborne and Earle[1] that neither of the known species of *Pachyæna* (*gigantea* and *ossifraga*) can stand directly in the line of descent leading to *Mesonyx* on account of the greater reduction of the last upper molar in the two species of *Dissacus* (*navajovius* and *saurognathus*) than in *Pachyæna*. Scott has shown[2] that *Mesonyx* has only two superior true molars, so that any species of *Pachyæna* which exhibits a less reduction of the last upper teeth than *Dissacus* cannot be placed ancestral to *Mesonyx*. Fortunately the collections of the Museum contain a specimen of a *Pachyæna* from the Big Horn, obtained by the expedition of 1896, which shows, proportionately, as great or a little greater reduction of the last upper molar than *Dissacus navajovius*. The specimen consists of the last two upper molars and bears the Museum number 2854. The teeth in question are somewhat smaller than the corresponding ones in *P. ossifraga* and exhibit a considerably greater reduction of the last molar in comparison with the tooth in advance than in this species. It

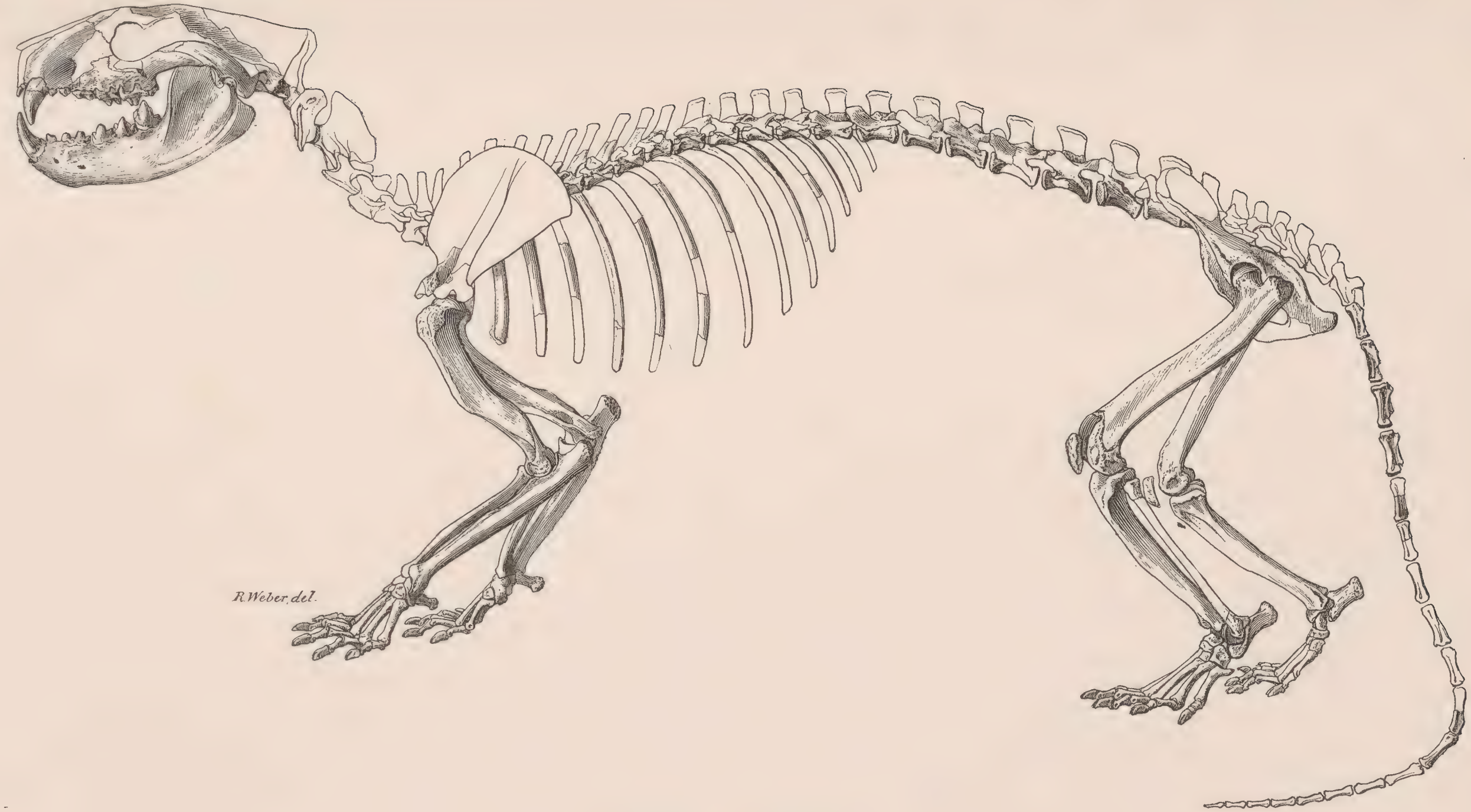
[1] 'Fossil Mammals of the Puerco,' Bull. Amer. Mus. Nat. Hist., Vol. VII, March, 1895, p. 39.
[2] 'Some New and Little Known Creodonts,' Jour. Philad. Acad. Nat. Sci., 1886, Vol. I.

may be that the specimen represents only a smaller variety of *P. ossifraga* and is not entitled to a specific rank, but in view of the fact that it furnishes just the character which, upon general grounds, one would be led to anticipate, I have thought fit to give it the above name.

This virtually completes the series of the *Dissacus-Pachyæna Mesonyx* phylum and establishes a closely connected specific descent reaching in time from the Torrejon to the White River without any important break. The Wind River representative of this series, however, yet remains to be discovered, but in accordance with what we already know its characters can be most accurately predicted.

EXPLANATION OF PLATE VII.

Oxyæna lupina, Cope. Skeleton, 1/6th natural size. No. 107, Am. Mus. Coll. The specimen described and figured as "No. 2" by Prof. Cope in 'Tertiary Vertebrata of the West,' (p. 319, pl. xxiv*c*, figs. 12–15, and pl. xxiv*d*, figs. 1–18) is a part of this individual.



Oxyæna lupina *Cope*.

One-sixth natural size.

Article VIII.—SYNOPSIS OF THE SPECIES OF MELITTIA OF AMERICA, NORTH OF MEXICO, WITH DESCRIPTION OF A NEW SPECIES.

By William Beutenmüller.

All the species of *Melittia* mentioned in the following paper are in the collection of the Museum, including the types of *M. gloriosa* (female), *M. snowii* (male), and *M. magnifica* (female).

The latter is by far the most brilliant species of the genus, and it seems strange that an insect so well marked should not have been described before.

Snowii is represented in the collection by a single male, and more material is very much needed to give a perfect description of the species. Of *M. grandis* and *M. gloriosa* we possess a pair of each species, and more specimens are also wanted of these species. *M. satyriniformis* we have in numbers from New York, and one example from Buenos Ayres, S. A.

Melittia *Hübner.*

Head large, tongue rather long; antennæ dilated before the tip, with fascicles of cilia in the male, simple in the female; palpi erect, second joint slightly hairy. Fore wing as in *Sciapteron* in shape and venation. Hind wing with vein 3 given off before the end of the cell; vein 6 present. Hind tibia and tarsus clothed with thick long hair. Body robust; abdomen tapering; anal tuft slight.

Synopsis of Species.

Small Species (24–34 mm.):

Fore wings metallic green.
Abdomen red, with row of black spots.....*satyriniformis.*
Fore wings light gray brown.
Abdomen brown along the back, pale orange along the sides..*snowii.*

Large Species (38–45 mm.):

Hind wings orange in female.
Abdomen with two segments yellow above, white beneath, *gloriosa.*
Abdomen metallic steel blue.
Fore wings steel blue and orange.....*magnifica.*
Hind wings transparent in both sexes.
Abdomen brown above, pale orange beneath.....*grandis.*

Melittia satyriniformis *Hübner.*

Melittia satyriniformis Hübner, Zuträge Exot. Schmett. Vol. III, 1825, p. 176.
Ægeria cucurbitæ Harris, New England Farmer, Vol. VIII, 1828, p. 33.
Trochilium ceto Westwood, Orient. Cab. Ent. 1848, pl. 30, fig. 6.
Melittia amœna Hy. Edwards, Papilio, Vol. II, 1882, p. 53.

Head metallic green on top; face white; palpi pale orange, whitish at base; antennæ green black. Thorax metallic olive green; sometimes green brown. Legs orange; tarsi black, banded with white. Hind legs clothed with long orange red hairs outside and with long black hairs inside. Abdomen above orange red, with a row of small black spots along the back; hind edges of segments very narrowly banded with metallic green; basal segment green black above and below. Underside orange. Fore wings dark metallic green, with the fringes brownish black; under similar to the above. Hind wings transparent in both male and female, opalescent in certain light; veins black, fringes brown.

Expanse, 24–34 mm.

Habitat: Canada, United States, Central and South America.

Melittia snowii *Hy. Edwards.*

Melittia snowii HY. EDWARDS, Papilio, Vol. II, 1882, p. 53.

Head and thorax gray brown; palpi whitish. Abdomen pale orange along the sides, light brown along the back, and pale grayish brown beneath. Fore wings pale gray brown without any metallic lustre. Hind wings transparent, fringes gray brown. Anterior pairs of legs whitish, mixed with light brown hairs; anterior coxæ white. Hind legs whitish outside; tibiæ orange inside; tarsi black inside.

Expanse, 24 mm.

Habitat: Kansas (Douglass Co., 9000 feet).

Allied to *M. cucurbitæ.* The fore wings are pale gray brown without any metallic lustre. The species was described from two males, and these are, as far as we are aware, the only specimens known to exist in collections.

Melittia gloriosa *Hy. Edwards.*

Melittia gloriosa HY. EDWARDS, Bull. Brooklyn Ent. Soc. Vol. III, 1880, p. 71.

Head grayish brown on top; face white; palpi white outside; yellowish above and inside. Thorax gray brown or olivaceous, edged with orange posteriorly. Antennæ strongly biciliate, brownish, orange towards the tip. Anterior pair of legs whitish, tibiæ black; posterior legs with long orange hairs inside; black outside, with a straw yellow streak at base of tibiæ.

Abdomen, with top of the first, second, and fourth segments, gray brown; third and fifth segments yellow; sides orange; last two segments gray brown with a decided metallic, light blue reflection. Underside white. Fore wings gray brown or olive green, with brown black fringes edged with light orange; underside bright orange, costal edge yellow, fringes same as above. Hind wings of female bright orange above and below, fringes brown black, orange

along inner margin. Hind wings of male transparent, with veins and inner margin orange.

Expanse, male, 40–45 mm.; female, 40–58 mm.

Habitat: Arizona and Southern California.

Melittia grandis *Strecker.*

Trochilium grande STRECKER, Can. Ent. Vol. XIII, 1881, p. 156.
Melittia beckeri DRUCE, Ann. and Mag. Nat. Hist. (6) Vol. IX, 1892, p. 276; Biologia Cent.-Am. Vol. II, Het. 1896, p. 325, pl. lxix, fig. 18.

Head and thorax olive gray brown; palpi yellow. Legs yellow, tarsi ringed with black. Hind legs with long orange hairs inside, and black on top from about the middle of the tibiæ to nearly the tip of the tarsi; underside of hind legs white, spurs black. Abdomen brown along the back, sides orange, and underside pale orange. Fore wing green brown above, yellowish beneath, green brown at apex. Hind wings transparent in both sexes, veins marked with dirty orange; fringes green brown, marginal line blackish.

Expanse, male, 38 mm.; female, 45 mm.

Habitat: Arizona, Texas, and Mexico.

Closely allied to *M. gloriosa*, but differs from this species in color of the abdomen, and by having the hind wings transparent in both sexes. The pectinations of the antennæ are also shorter than in *gloriosa*. The insect described by Mr. Druce as *M. beckeri* is without doubt the same as *grandis*. Both description and figure agree with the specimen of *grandis* before me.

Melittia magnifica, sp. nov.

Head blue black; palpi orange, with the extreme tip black. Thorax steel blue, tipped with orange on each side posteriorly. Antennæ blue black, ferruginous towards the tip beneath. Abdomen metallic steel blue black above and below. Two pairs of anterior legs steel blue black (hind pair wanting). Fore wings bright steel blue black, with the inner part broadly light orange. The light part covers more than half the width of the wings tó a little beyond the middle, where it curves downward to a point touching the hind angle. Fringes light orange. Hind wings deep orange above and below. Fore wings beneath orange, outer fourth black; fringes orange.

Expanse, 42 mm.

Habitat: Austin, Texas.

Described from one female, collected by Mr. Joseph Mattes. It is the most beautiful and brilliant species of the genus. The hind legs unfortunately are wanting, but these are probably entirely steel blue, or are mixed with orange.

Article IX.—DESCRIPTIONS OF FIVE APPARENTLY NEW BIRDS FROM VENEZUELA.

By Frank M. Chapman.

The American Museum has recently received from Mr. F. W. Urich of Port-of-Spain, Trinidad, a small collection of birds made by him in Venezuela, about ninety miles from Cumana in the mountains near San Antonio, at an altitude of from 2000 to 4000 feet, at Campo Allegre and Caripe.

The collection contains only thirty-seven species, of which no less than seven were previously unrepresented in the Museum's collection, and five of these appear to have been undescribed, a fact which suggests that we have as yet only a superficial knowledge of the birds of this region.

Setophaga verticalis pallidiventris, subsp. nov.

Char. Subsp.—Similar to *Setophaga verticalis* but somewhat smaller, with a smaller bill and the yellow of the under parts decidedly paler.

Description of Type.—(No. 70341, Coll. Am. Mus. Nat. Hist., Quebrada Seca, Venezuela, December 2, 1898. Collected by F. W. Urich. Collector's No. 50.)—Crown chestnut, rest of the upper parts, sides of the head, and the throat slate color, centre of the throat more blackish ; wings black, the outer quills slightly margined with gray, the under surface and under coverts whitish ; tail black, the two outer feathers with about the terminal half white, the third outer feather white for the terminal third ; under parts, except throat, lemon-yellow. Wing, 2.42 ; tail, 2.56 ; exposed culmen, .33 inches.

Of this new race Mr. Urich sends five specimens. They show little variation in color, the amount of white on the third rectrix being the only variable character. From four specimens of *verticalis* from Bogota and Ecuador they can be at once distinguished by the decidedly paler color of the yellow under surface.

Chlorospingus (Hemispingus) canipileus, sp. nov.

Char. Sp.—Most nearly related to *Chlorospingus superciliaris* (Lafr.) and *C. reyi* Berl., but differing from the former in the extension of the gray crown, and from the latter in the presence of a white ante-orbital stripe and in other particulars.

Description of Type.—(No. 57391, Coll. Am. Mus. Nat. Hist., Los Pal-

males, Venezuela, December 3, 1898. Collected by F. W. Urich. Collector's No. 26.)—Crown, nape, and sides of the head, including the auriculars, bluish gray ; chin, some of the feathers about the base of the sides of the bill, and a line from above the anterior border of the eye to the nostril white ; back, rump, and exposed portions of the wings and tail bright olive-green ; under parts, except chin, rich yellow, more greenish laterally. Wing, 2.52 ; tail, 2.42 ; exposed culmen, .48 ; depth of bill at nostril, .09 inches.

This species is based on a single well-plumaged, well-prepared, but, unfortunately, unsexed skin. Its nearest relationships are obviously with *C. superciliaris* and *C. reyi ;* in fact, it appears to be intermediate between the two, though the region whence it comes prohibits the idea of considering it as a true connectant.

I have three Bogota examples of *C. superciliaris*, a species which appears to be restricted to Colombia, my three Ecuador specimens being referable to *nigrifrons* Lawr. *C. canipileus* differs from them in the restriction of the white superciliary line to the ante-orbital region, in its white chin, in the deeper shade of the gray of the head and its extension over the entire crown, nape, and sides of the head, in the greater intensity of the olive-green of the upper parts and yellow of the under parts, and in its slightly smaller size.

From *C. reyi*,[1] which is known only from Berlepsch's type from Merida, Venezuela, *canipileus* differs in the possession of a white ante-orbital streak and white chin, and, apparently, in the greater extension of the gray of the crown on the sides of the head. In *canipileus* this gray includes the auriculars and reaches the sides of the throat ; in *reyi* a broad olivaceous stripe is stated to begin at the upper edge of the eye, and, including the upper edge of the auriculars, to join the olive-green of the back, while the rest of the sides of the head are described as yellow.

Mecocerculus nigriceps, sp. nov.

Char. Sp.—Similar to *Mecocerculus leucophrys* but crown blackish and back dark olive-green ; superciliary line less distinct.

Description of Type.—(No. 70381, Coll. Am. Mus. Nat. Hist., male, Las Palmales, Venezuela, December 7, 1898. Collected by F. W. Urich. Collector's No. 49.)—Whole top of head to upper margin of the auriculars blackish fuscous ; an indistinct superciliary line ; back dark olive-green, with brownish tinge ; wings blackish, the greater and lesser coverts broadly tipped with buffy

[1] *Chlorospingus reyi* Berlepsch, Ibis, 1885, 288.

white, the secondaries externally margined with a deeper shade of the same color; tail fuscous, externally margined with the color of the back; throat and upper breast grayish white, passing into pale yellowish on the abdomen. Wing, 2.10; tail, 2.10; exposed culmen, .40 inches.

The single specimen on which this new species is based differs markedly from its nearest known ally, *M. leucophrys*, from which it appears to be specifically distinct.

Mecocerculus urichi, sp. nov.

Char. Sp.—Most nearly related to *Mecocerculus consobrinus* (Berl.) but upper parts bright yellow green, head without "dark ashy or blackish,"[1] primaries without rusty yellowish, wings and tail shorter, etc.

Description of Type.—(No. 70384, Coll. Am. Mus. Nat. Hist., female, Quebrada Seca, Venezuela, November 26, 1898. Collected by F. W. Urich. Collector's No. 7.)—Upper parts bright yellowish olive-green, slightly duller on the forehead; lores whitish, auriculars greenish yellow; wings blackish, all the quills, except the outer primary, margined externally with greenish yellow, this margin widening on the inner secondaries, and extending to include the tip of the feather where the color is whiter; greater and lesser wing-coverts broadly tipped with yellowish white; under wing-coverts and bend of the wing lemon-yellow; inner margin of the quills whitish, increasing in width on the secondaries; tail fuscous, margined externally with the color of the back; under parts bright lemon-yellow, somewhat whiter on the throat and greener on the sides of the breast. Wing, 2.30; tail, 2.20; exposed culmen, .32; height of bill at base, .15 inches.

The collection contains but one specimen of this interesting bird which evidently finds its closest relationships with *Mecocerculus consobrinus* described by Berlepsch from a single Bogota specimen. The differences separating the two birds, however, are apparently too numerous and important to leave any doubt of their specific distinctness. Aside from its smaller size, *M. urichi* is evidently a much greener bird, the back being bright olive-green instead of "dark" olive-green, the wings and their coverts being margined with yellowish instead of olive-green or rusty, and the crown lacks the "dark ashy or blackish color" ascribed by Berlepsch to *consobrinus*. The two birds, however, are evidently nearly related and in my opinion should be referred to a new genus distinguished from *Mecocerculus* by its more compressed bill and more convex culmen, resembling, in this respect, *Tyranniscus* rather than *Mecocerculus*.

[1] *Cf.* Berlepsch, Orig. descr., Ibis, 1885, 289.

It gives me pleasure to name this species for its collector, Mr. F. W. Urich, who, as the honorary secretary of the Trinidad Naturalists' Field Club, has done so much to further the interests of science in that island.

Synallaxis striatipectus, sp. nov.

Char. Sp.—Similar to *Synallaxis terrestris* Jardine but breast and abdomen heavily streaked.

Description of Type.—(No. 70393, Coll. Am. Mus. Nat. Hist., female, Quebrada Seca, Venezuela, November 28, 1898. Collected by F. W. Urich. Collector's No. 19.)—Upper parts mummy-brown,[1] wing-coverts and exposed portion of quills chestnut-rufous, tail much darker than the back; throat white, the feathers laterally margined with black; breast and abdomen to the crissum heavily streaked with black and russet, paler posteriorly; flanks bistre, unstreaked. Wing, 2.22; tail, 2.70; exposed culmen, .50 inches.

This is an interesting addition to the group of birds composed of *Synallaxis terrestris* Jardine from Tobago, *S. carri* Chapm. from Trinidad, and *S. læmosticta* Scl. from Colombia. Of these three species it is, perhaps, most nearly related to *carri*, representing in a more marked degree the characters which distinguish *carri* from *terrestris*. In a measure it stands between *carri* and *læmosticta*, but whereas the streakings on the under surface of that bird are more or less obscure, in *striatipectus* they are well defined; furthermore, in coloration *læmosticta* is much more rufous throughout. In fact, in color *striatipectus* most nearly resembles *racri*, from which, however, it differs widely in the conspicuous striations of the under surface.

[1] *Cf.* Ridgway's 'Nomenclature of Colors.'

Article X.—ON SOME SPECIES OF NORTH AMERICAN LEPIDOPTERA.

By William Beutenmüller.

The present paper contains a redescription of *Notolophus* (*Orgyia*) *inornatus* and its larva, which were imperfectly described by me in Psyche, Vol. V, 1890, p. 300. It also contains a synopsis of the genus *Trochilium* and notes on *Sanninoidea exitiosa* with description of a new female variety. I am under obligation to Mr. Samuel Henshaw for the loan of all of Harris's types of Sesiidæ, and to Dr. G. H. Hudson for a pair of *Trochilium tibiale*, and also to Mr. M. V. Slingerland, for specimens of *Sanninoidea exitiosa* var. *edwardsii*.

Notolophus inornatus (*Beuten.*).

Orgyia inornata Beutenmüller, Psyche, Vol. V, 1890, p. 300; Journ. N. Y. Ent. Soc., Vol. II, 1894, p. 30; Dyar, Psyche, Vol. VI, 1891, p. 420.

Notolophus inornatus Kirby, Cat. Lepid. Het., Vol. I, 1892.

Male.—Head and thorax smoky brown; abdomen somewhat paler. Thorax with a bunch of submetallic black, raised scales at the posterior end and a similar bunch on the second abdominal segment. Fore wings smoky brown with a wavy scolloped line across the basal third and one across the outer third, which bends inward before it reaches the inner margin. The space between these lines is mixed with dull ochreous and is grayish at the costal area, including the reniform mark, which is outlined with black. Beyond the outer curved line the wing is dull ochreous with a row of black spots. Terminal line black, edged with gray inwardly. Fringes smoky brown. Hind wings uniform smoky brown. Underside of all wings dirty ochreous brown with a broad smoky black transverse band across the apical third; fore wings smoky black at base. Expanse, 23–29 mm.

Female.—Wingless, dirty whitish above and below. Length 16 mm.; width 7 mm.

Full-grown Larva.—Head coral red. Body silvery gray, with a bunch of white hairs on each of the fourth to seventh segments inclusive; pencils on first segment black as is also the one on the eleventh segment. Other hairs on body white. Along the back is a broad black stripe, broken by the bunches of hairs. Warts orange. Underside dirty white. Length, 30–35 mm.

Food-plants.—Live oak, cypress, and possibly other plants.

Cocoon.—Oval, dirty whitish, and mixed with hairs of the larva. Length 15–25 mm. The egg mass covers the upper surface of the cocoon and is mixed with hairs of the female.

Habitat.—Indian River and Anastasia Island, Florida (opposite St. Augustine).

Allied to *N. leucostigma*, but differs from it by having ochreous shades on the fore wings, and by the absence of the white spot. The egg mass is similar to that of *definitus*, and it is not covered with a white frothy substance as in *leucostigma*. Most of the larvæ were silvery gray, though a few of the females were dirty yellow.

The species was described from a single worn male and was considered by Dr. Dyar to be a synonym of *leucostigma*. It is, however, a distinct species allied to, if not identical with, *O. falcata* (Schaus, Journ. N. Y. Ent. Soc., Vol. IV, 1896, p. 153) from Jalapa, Mexico. The figure (Biologia Cent.-Am., Vol. II, Het., pl. 79, fig. 7) of *falcata* very closely resembles *inornatus* and the two may prove identical after a comparison of the types. During a short trip to St. Augustine last April, I was fortunate enough to find near the light-house on Anastasia Island, a number of larvæ of *inornatus* from which I bred three males and a number of females.

Trochilium *Scopoli.*

Antennæ of male pectinated, simple in the female; rather short and thick. Palpi upturned, reaching the top of the head, basal joint hairy. Middle and hind tibiæ slightly hairy. Abdomen robust, cylindrical, rounded at apex. Fore wings with 11 veins; 7–8 stalked. Hind wings with veins 3–4 from angle of cell; discocellulars very oblique. Type, *T. apiforme* Linn.

Synopsis of Species.

Thorax with a yellow line on the patagia.
Abdomen banded with yellow.....*tibiale.*
Abdomen entirely yellow, except the first two segments.....*pacificum.*
Thorax with a large yellow spot on each side anteriorly.....*apiforme.*

Trochilium apiforme (*Linn.*).

Head lemon-yellow, face brown; antennæ black above, ferruginous beneath; palpi yellow. Legs yellow, femora washed with brown. Thorax smoky brown

with a large yellow spot on each side in front and two similar spots behind. Spots sometimes more or less united by a yellow shade along the patagia. Abdomen with broad yellow bands, sometimes the second and fourth segments entirely brown. Last two segments entirely yellow. Wings transparent with narrow light brown borders and discal mark on the fore wings. Expanse, male, 30–35 mm. ; female, 40–45 mm.

Habitat.—Europe, Siberia, United States westward to Nevada.

Trochilium tibiale *Harris.*

Head yellow, face dark brown ; palpi yellow with a tuft of brown hairs at the base, especially so in the male ; antennæ black. Thorax dark brown-black with a very narrow yellow line on the inner edge of the patagia. On each side of the anterior part of the thorax is a curved yellow line, beginning at the base of the wing and meeting at an angle with the line on the patagia. On the posterior part of thorax are two large yellow spots, which are less distinct in the male, as are also the lines. Abdomen with a narrow yellow band at the anterior edge of the second segment and a broader one on the third, fifth, and sixth segments ; the latter two bands are half as broad as the segment ; last segment yellow, brown at tip. In the male the rings on the last four segments are much narrower. Underside with a band to each segment. Legs yellow, washed with brown. In the female there is an oblique yellow line at the hind part of the thorax, beneath, connecting with the line at the base of the fore wings. Wings transparent, narrowly bordered with brown and a transverse mark of the same color at the end of the cell. Expanse, male, 32 mm. ; female, 38 mm.

Habitat.—Eastern Canada and New York to Vancouver Island.

Trochilium pacificum *Hy. Edw.*

Head and palpi yellow ; face brown ; antennæ black on top, rufous beneath. Thorax brown with a narrow yellow line on each patagium, connecting in front at an angle with a curved line which runs to the base of the wing ; posterior part of thorax edged with yellow. First and second segments of abdomen black, with a very narrow yellow ring on the anterior edge of the second ; remaining segments wholly lemon-yellow, above and below. Legs yellow. Wings transparent with narrow brown borders. Expanse, male, 20–25 mm. ; female, 35–40 mm.

Habitat.—California, Nevada, Montana, and Washington.

Sanninoidea *Beuten.*

Sanninoidea BEUTENMÜLLER, Bull. Am. Mus. Nat. Hist., Vol. VIII, 1896, p. 126.

Palpi scarcely upturned, loosely scaled on first and second joints ; third joint with appressed scales. First joint very short ; second joint three times as long as the first ; third joint much thinner than the second, and about one-

third as long. Antennæ filiform, simple in the female, with fascicles of cilia in the male. Middle and hind legs tufted at the joints. Anal tuft of male wedge-shaped; female with a short tuft on each side, at the base of the last segment. Fore wings with eleven veins; 7–8 stalked. Hind wings with veins 3–4 on a short stalk, 2 from cell. Type, *Ægeria exitiosa* Say.

Sanninoidea exitiosa (*Say*).

This well-known species is subject to variation in both male and female. The type form has the fourth segment orange in the female, and the male has the margins of the wings blue-black. Say, in the original description, states that the fifth segment of the abdomen of the female is banded with orange instead of the fourth; but his figure shows the fourth segment banded. The most common form has the fourth segment orange, but some individuals which I bred show distinct traces of having the fifth segment also orange. Mr. Slingerland informs me that all the specimens of the female he gets at Ithaca, N. Y., have both the fourth and fifth segments orange. Fitch (First Rep. Nox. Ins., p. 115) also stated that all the specimens he had seen, had both these segments orange. In the Neumoegen collection is also an example from Florida, labelled by Hy. Edwards, "var. *fitchii*, type," which has the fourth and fifth segments orange, but his description (Papilio, Vol. II, 1882, p. 55) applies to the common form which has only the fourth segment of the abdomen orange, and in which the space between the two inner veins of the hind wing is nearly or quite covered with blue-black scales, forming a stripe which divides the transparent area into two parts. I herewith propose the varietal name *edwardsii* for the form of the female which has both the fourth and fifth segments banded with orange, and the space between the two inner veins wholly or partly scaled with blue-black. Prof. Otto Lugger, in his Fourth Report of Insects of Minnesota, p. 58, figures this two banded form. His specimens are from Ohio. In the male variety, *luminosa* Neum., the borders of the wings are heavily scaled with yellow.

Article XI.—FORE AND HIND LIMBS OF CARNIVOROUS AND HERBIVOROUS DINOSAURS FROM THE JURASSIC OF WYOMING. DINOSAUR CONTRIBUTIONS, NO. 3.

By Henry Fairfield Osborn.

In the Bone Cabin Quarry, opened by the American Museum Expedition of 1898, under the direction of Dr. J. L. Wortman, assisted by Mr. W. W. Granger, were found mingled together bones of all the most characteristic Upper Jurassic Dinosaurs, including six nearly or quite complete limbs and three fore feet, which form the subject of this paper. Four of these are shown, as mounted, upon a subsequent page. They are not only grand objects of their kind, but they bring out a number of new and important facts relating to the limbs of Dinosaurs of the Megalosaur and Cetiosaur divisions or Ornithopoda and Sauropoda.

1. Hind Limbs of Carnivorous Dinosaurs.

Figures 1–5.

The late Professor O. C. Marsh described [1] five genera of flesh-eating Dinosaurs from our Jurassic, namely: *Allosaurus*, the largest of the flesh-eaters; *Creosaurus*, a smaller allied form; *Labrosaurus*, of another type; *Cœlurus*, a very small animal distinguished by hollow bones (related to the somewhat older *Hallopus*); and finally *Ceratosaurus*, a large animal with horned nasals.

Of these, the most nearly allied to *Megalosaurus* of the English Purbeck is *Allosaurus*, distinguished by possessing less than five vertebræ in the sacrum, also by other characters of doubtful value (*op. cit.*, p. 239), and figured (*op. cit.*, Pl. XI.) as possessing *three* digits in the pes, while *Megalosaurus* is assigned *four* digits in the pes (*op. cit.*, p. 239). Whether or not *Allosaurus* is distinct from *Megalosaurus* cannot be positively determined at present. The distinction based upon the number of digits is here shown not to hold good.

Two hind limbs from the Bone Cabin Quarry, which correspond in other respects with those of *Allosaurus*, appear to show that the hallux had been detached in Marsh's specimens. They

[1] The Dinosaurs of North America, 1896.

(Nos. 290 and 324) both possess four digits in the pes; the first digit or hallux exhibits an interrupted metatarsal, and is turned inwards as a subsidiary grasping toe.

The proportions between these limbs and those of the two Sauropoda described below are well shown in the accompanying photographs (Fig. 1). The heights in the Table include the curvatures; they give us therefore the usual height of the acetabulum, or head of the femur, not the total length of the limb.

Fig. 1. Right Hind Limbs of Dinosaurs. A, Herbivorous Dinosaur, probably *Diplodocus*, No. 251. B, Herbivorous Dinosaur, *Brontosaurus*, Nos. 309, 353. C, Carnivorous Dinosaur, *Allosaurus*, or *Megalosaurus*, No. 290. D, Carnivorous Dinosaur, *Allosaurus* or *Megalosaurus*, Nos. 324, 275. Approximately $\frac{1}{35}$ nat. size.

The larger of the limbs (No. 290) is the more perfect, except that it lacks the proximal portion of Mt. I. The smaller (No. 324) has the calcaneum and astragalus restored, and a femur (No. 275), which was found at some little distance, is arbitrarily placed with it. Except for differences in size, due to age or sex, the limbs are practically identical in character.

Measurements.

	No. 290.	No. 324.	No. 275.
Length of femur	985	.....	910
" " tibia	810	698	
" " fibula	764	665	
" metatarsal II	375	315	
" " III	425	352	
" " IV	360	330	
Width of ankle joint			
Calcaneum and astragalus	241		
Total height of limb	2182	.....	1980

Of greatest interest is the *first digit, or hallux*, not before described. Proximally (Fig. 4 a) its metatarsal fits in a shallow groove of the upper portion of the large metatarsal II. The shaft is entirely interrupted or composed of cartilage in the middle portion. Distally it is fitted to the rounded posterior shaft of Mt. II, demonstrating that this digit was directed inwards like the small hallux of *Apteryx* (Fig. 5). It possesses, however, a complete and functional phalanx and claw, which undoubtedly were of service in grasping.

Fig. 2. Carnivorous Dinosaur, No. 290. Same Limb as Fig. 1, C, showing proportions to human stature (Dr. J. L. W.). $\frac{1}{48}$ nat. size.

The digits II, III, IV, with phalanges numbering 3, 4, and 5, respectively, are well shown in the photographs (Figs. 4, 4 a). The lower row of tarsals is represented by two bony elements only, probably tarsalia 3 and 4.

The upper tarsals, astragalus and calcaneum are closely conjoined if not actually co-ossified.

Fig. 3. Right Hind Limb of Carnivorous Dinosaur, No. 290. Oblique internal view. $\frac{1}{16}$ nat. size.

The tibia forms the entire back portion of the ankle joint, the fibula lying in front of it; this bone is further distinguished by its curved shaft, and powerful muscular crest projecting towards the fibula at its upper third. There is a very prominent cnemial crest, which has a deep groove upon its outer side towards the fibula; this groove is entirely concealed from the front. This bone is very different from that assigned to *Megalosaurus* by Owen.[1]

The fibula has a slender, subrounded shaft, but expands proximally and distally upon the tibial side.

The femur is distinguished by its marked curvature and well-rounded head, by the laterally compressed and inferiorly placed great trochanter, by an internal trochanter much more elevated than in the Iguanodontia, and by a large rugose area on the inferior front face of the shaft above the internal condyle. The inner trochanter is broken off in the smaller femur, No. 275.

[1] Fossil Reptilia of the Wealden and Purbeck Formations, Pt. III, 1857, p. 18, Tab. lx.

2. Hind Limbs of Cetiosaurs.

Figure 1.

The *smaller* of these limbs (Fig. 1, A, No. 251) was fortunately found nearly complete and in position, all parts being preserved excepting the head of the femur. It was removed and worked out with the greatest care by Mr. Granger. There is thus absolutely no doubt about the position of the phalanges.

This limb is of a type distinct from the larger one, which is undoubtedly a Brontosaurus. We should unhesitatingly refer it to *Diplodocus*, were it not that the fourth trochanter has a more elevated position than in the *Diplodocus* femur recently described by the writer,[1] and that the pes differs from the pes of *Diplodocus* figured by Marsh ('96, Plate 28). None the less it is a *long-limbed type*, and this we believe to be a characteristic distinction of *Diplodocus*. It has the following characters :

1. Tibia and fibula very long and slender.
2. Femur long with relatively slender shaft.
3. Metatarsals I and II as in *Brontosaurus*.
4. Metatarsal III much more slender than in *Brontosaurus*.
5. Metatarsal IV still more slender, two osseous phalanges.
6. Metatarsal V more slender, no osseous phalanges.

This limb may prove, therefore, to represent merely a form of Brontosaur distinct specifically from *B. excelsus*. But, in spite of the exceptions noted above, the probabilities are that it belongs to *Diplodocus*, for this animal is abundantly represented in the Bone Cabin Quarry by parts of several series of caudal vertebræ, besides pelvic and other bones.

Measurements.

	No. 251.	No. 309.	No. 353.
Total height of limb	e 2920		3040
Femur, height	e 1430		1640
Femur, circumference below tr. 4	560		e 730
Tibia, length	1060	1080	
Tibia, circumference	390		e 480
Fibula, length	1120	1130	
Astragalus, width of	227	280	
Pes, width of proximal metatarsal surfaces,	410	445	

The circumferences of the various shafts are very important

[1] Osborn, "A Skeleton of *Diplodocus*." *Mem. Am. Mus. Nat. Hist.*, I, Pt. IV, 1899.

when compared with the total lengths. In each case the least circumference is taken. The total height of the limbs is measured *as mounted*—that is, including the curves.

The larger limb (Brontosaurus) is 10 feet high. The smaller limb (? Diplodocus) is 9 feet 7 inches high.

The *larger* limb (Fig. 1, B, Nos. 309, 353) is of the true *Bronto-*

Fig. 4. Right Hind Foot of Carnivorous Dinosaur, probably *Allosaurus* (No. 324, same specimen as Fig. 1, D¹. Front view. $\frac{1}{8}$ nat. size.

saurus type. All of the bones of the lower leg and pes belong to one individual, excepting the terminal claws I and II. The femur was found at some distance and is arbitrarily associated. The phalanges are complete and osseous upon D. I, II, III.

This and the foregoing specimen prove conclusively that Marsh was in error in restoring a complete series of bony phalanges and

Fig. 4*a*. Right Hind Foot of Carnivorous Dinosaur, probably *Allosaurus* (No. 324, same specimen as Fig. 1, D.) Oblique side view. $\frac{1}{6}$ nat. size.

claws upon digits IV and V. The phalanges upon digits IV and V were cartilaginous or incomplete; these outer digits functioned only in supporting the foot pad. Every known Sauropod pes shows the same deficiency upon the outer side.

3. Fore Feet of Cetiosaurs.

Figures 6, 7.

Two restorations of the fore feet of the Sauropoda have been published by the late Professor Marsh, namely those of *Morosaurus* ('96, Plate 38) and *Brontosaurus* (*op. cit.*, Plate 42). It appears probable that both are incorrect; the error apparently has arisen, first, from supplying all the digits with a complete series of phalanges; second, from placing the largest phalanges upon the inner or 1st digit (as in the pes) and grading off the smaller phalanges to the 5th or outer digit. It is now practically certain that in the manus as in the pes a number of phalanges were either cartilaginous or missing entirely. It also appears probable that the three central digits II, III, IV bore a full series of phalanges and claws, while the outer digits were deficient in phalanges.

Fig. 5. *Apteryx*. Internal view of right pes.

Fore Feet of Undetermined Cetiosaur.

The strongest evidence comes from the two fore feet of one individual (No. 332), one of which was found with all its parts in

169 Fig. 6. Right (A) and Left (B) Fore Feet of Herbivorous Dinosaur, No. 332. At present indeterminate. $\frac{1}{6}$ natural size.

position (Fig. 6). The right manus is more complete in certain parts, the left manus in others. The animal is possibly a *Morosaurus agilis.*

The Metacarpal of the first digit is much longer and more slender than in either the typical *Morosaurus* or *Brontosaurus.* A single phalanx was found near it, rounding off distally and quite distinct from the first phalanges of digits II, III, IV.

The second Metacarpal is still longer and is supplied with the characteristic broad phalanx 1, the narrow phalanx 2, and the terminal claw or phalanx 3. This digit is slightly heavier than the 3d.

The third or middle digit is the longest; the 1st phalanx is broad, the 2d and 3d are restored, the 4th is complete, and was found associated in the left manus.

The fourth digit presumably had four phalanges, but only phalanx 1 is preserved in each case; and it has the same broad form as in D. II and III. The fifth digit is of about the same length as the first, and is likewise supplied with a single phalanx unformed or rounded distally, without any distinct facet for a second phalanx.

It thus appears certain that in this animal (No. 332) the middle three digits were fully functional and provided with claws, while the lateral digits were incomplete distally and served only to support the weight of the body.

Fore Feet of Brontosaurus.

Figure 7.

The question now remains whether the fore feet of *Brontosaurus* were also similarly constructed upon a mesaxonic plan.

Marsh restored (*Brontosaurus, Morosaurus*) the manus like the pes with a complete series of claws, the largest being on the inside.

The evidence is very positive in the two feet here mounted that *there was a deficiency of phalanges.* The evidence, however, that the actual construction of the foot is as we have mounted and photographed it (Fig. 7), namely, mesaxonic, is by no means positive. The question, in fact, cannot be definitely settled until a manus is found with all the digits in position, as in the pes above described.

The large fore foot (No. 268) was found with the metacarpals in position, and the phalanges scattered. The two terminal claws of digits III, IV, were not found with this foot, but some distance from it. Phalanges 2, 3, 4, of digit IV are restored in plaster. The foot is therefore nearly but not quite complete.

The broad 1st metacarpal has no distinct distal articular facet, such as are observed upon digits II, III, IV, and it seems probable

Fig. 7. Left Fore Foot of Large *Brontosaurus*, No. 268. The position of the phalanges is somewhat conjectural. $\frac{1}{6}$ nat. size.

that we are correct in associating with it the short phalanx with an imperfectly rounded distal extremity.

The 2d metacarpal is very powerful, with a heavy rounded shaft and distinct distal articulation, from which three phalanges extend, the terminal a heavy claw, if our placing is correct.

The 3d digit affords the strongest support for the mesaxonic hypothesis, for it is by far the largest metacarpal, and is obviously the centre of the foot. With it must have been associated (as in the present mounting) the heaviest phalanges and claw.

The 4th metacarpal is considerably lighter and longer, and unfortunately its complement of phalanges is represented only by phalanx 1, the others being added or restored.

The 5th metacarpal is stout but slightly shorter than the 4th. With it was apparently associated the remaining imperfectly formed phalanx 1, which was found with this foot.

If these two imperfect phalanges are not placed upon digits I and V, it is very difficult to place them at all. It thus appears probable that digits I and V were deficient in all the phalanges except the first or first and second, and served merely to support the weight of the animal.

The admirable methods in the field, which have been largely developed by Dr. J. L. Wortman, whereby every piece is kept and transported in the position in which it was found, supplemented by admirable museum methods, will soon render our knowledge of the Dinosaurs not only far more complete, but far more accurate than ever before. The writer is indebted to Dr. Wortman for many hints in the discussion of the carnivorous limbs above described. The writer desires also to express his indebtedness to Mr. Adam Hermann, not only for the skill displayed in mounting these specimens, but for the excellent judgment and knowledge he has shown in locating and bringing together the scattered parts. Owing to the imperfect ossification of the joints, the bones of Dinosaurs are much more difficult to place than those of mammals.

Article XII.—DESCRIPTIONS OF THREE NEW FREE-TAILED BATS.

By Gerrit S. Miller, Jr.

The American Museum of Natural History contains specimens of three Free-tailed Bats that have not hitherto been described. All were collected by Mr. Frank M. Chapman; one in Cuba, the two others on the island of Trinidad. My thanks are due to Dr. J. A. Allen for the privilege of examining the collection of bats in his charge, and also for facilities for work in the museum.

Nyctinomus minutus, sp. nov.

1892. *Nyctinomus brasiliensis* Chapman, Bull. Am. Mus. Nat. Hist., IV, p. 316. December 29, 1892 (part).

Type, adult ♂ (in alcohol), No. 4915, American Museum of Natural History, collected at Trinidad, Cuba, March 8, 1892, by Frank M. Chapman. Original number, 359.

General characters.—Smallest known species of *Nyctinomus* (forearm about 30 mm, longest finger about 56 mm); ears separate, small, distinctly pointed, and very slightly keeled; anterior edge of ear without trace of horny excrescences; pad at base of thumb broad and conspicuous; skull with short, broad rostrum and conspicuous lachrymal processes; dental formula,

$$\text{I}\ \frac{\text{I—I}}{2—2},\quad \text{C}\ \frac{\text{I—I}}{\text{I—I}},\quad \text{PM}\ \frac{\text{I—I}}{2—2},\quad \text{M}\ \frac{3—3}{3—3} = 28.$$

Muzzle and lips.—Muzzle produced, bluntly triangular, the tip about 3 mm in front of upper incisors. Nostrils and nostril pad as in *N. cynocephalus* from Florida, but the pad more sharply outlined, and bordered by longer, sharper, horny projections, which continue uninterruptedly over well-defined median ridge to lower border of pad. The triangular smooth space back of the nostril pad is relatively longer and narrower than in *N. cynocephalus*, and is distinctly truncate posteriorly between the bases of the ears. Stiff hairs bordering this area about 1 mm in length. Lips ample but much smaller and less wrinkled than in *N. cynocephalus*, the upper not distinctly overhanging the lower when mouth is shut. Spoonhairs few, their tips not well developed. They are confined to definite areas: on the upper lip below nostril pad, on the glandular portion of cheek between eye and nostril, and on sides of chin. Those on upper lip are conspicuously smaller than the others.

Ears.—Ears small; laid forward they reach to within about 2 mm of tip of muzzle. The inner margins arise 2 mm apart on forehead, 5 mm behind tip of muzzle, and about 2 mm in front of inner canthus of eye. Anterior border

of conch nearly straight from base to rather narrowly rounded-off tip, immediately below which is a barely noticeable concavity. Posterior border strongly and evenly convex from tip to a small concavity at level of tip of tragus, below this convex again to abrupt notch at base of antitragus. No cross striation on inner surface of conch. Keel occupying the same position as in *N. cynocephalus*, but reduced to a mere thickened ridge too low to be measured. Antitragus higher than broad, irregularly trapeziform in outline, the tip and anterior border concave. It sends forward a low ridge to angle of mouth.

Tragus narrower and higher than in *N. cynocephalus*, the anterior border distinctly longer than the superior. Tip broadly and evenly rounded off. Posterior border faintly concave.

Feet.—Structure and proportions of feet, tibiæ, and toes as in *N. cynocephalus.* No trace of wart at heel.

Calcar short (scarcely exceeding tibia), closely bound to tibia to near middle, very weak, and terminating without lobe. Posterior border with a few hairs, but no keel. Calcar considerably shorter than free border of uropatagium.

Tail.—The tail is as in *N. cynocephalus.* Caudal vertebræ seven.

Wings and membranes.—Wings long, but relatively less narrow than in *N. cynocephalus.* Base of thumb with a well defined disc-shaped pad 2 mm or more in diameter.

Membranes thick and leathery, opaque. Their surface is for the most part smooth, but over an area bounded on the outer side by a line from elbow to knee the dorsal surface of the wing is studded with minute elevations, each of which bears a tuft of almost microscopic hairs. A narrow, ill-defined pale border along free edge of wing. Attachment of wing to tibia apparently as in *N. cynocephalus.* Free border of uropatagium much longer than calcar. Propatagium extended outward along under side of forearm as a narrow fold nearly or quite to base of thumb.

Fur and color.—Fur very short and dense, 3 mm to 4 mm in length. It extends on wing membranes, both above and below, in a band about 5 mm wide running along sides of body from humerus to femur. On dorsal surface the fur barely reaches extreme base of uropatagium, which, however, is rather profusely sprinkled with hairs on the lower surface, especially near tail. Propatagium with a thin coating of very short hairs above near elbow and along free edge of narrow fold bordering forearm. Fur of head extending on back of ears over basal third. On under side of head the fur becomes abruptly sparse at line joining corners of mouth. Face naked except for an irregular sprinkling of fine hairs.

Color of two specimens, after seven years' immersion in alcohol, dull reddish brown, slightly paler ventrally, the hairs everywhere very inconspicuously lighter at extreme base.

Skull.—The skull of *Nyctinomus minutus* (fig. 1) is small, broad, flat, and lightly built. Profile nearly straight from nares to the highest point of occiput. Interorbital region irregularly and broadly hourglass-shaped. Braincase broader than long, and in occipital region slightly more than half as deep as wide. Sagittal crest represented by a low ridge; lambdoid crest moderately

developed. Rostrum broad and short, with a distinct median groove, its width including lachrymal processes considerably greater than distance from front of premaxillary to proencephalon. Lachrymal processes strongly developed, peg-like, overhanging lachrymal foramen, and plainly visible when skull is viewed from below. Position of postorbital process marked by a distinct, though minute elevation, connected by a ridge with lachrymal process; this ridge forming anterior rim of orbit. Antorbital foramen relatively large, opening distinctly forward immediately in front of lachrymal process and directly above middle of premolar. It is very conspicuous when skull is viewed from directly in front. Basisphenoid pits shallow and indistinctly outlined, separated by a broad, low, median ridge. Hamulars slightly thickened and turned outward at tips. Bony palate moderately arched, extending a little behind plane of last molar, terminating posteriorly in a broadly angular median projection. Zygomata nearly parallel with each other and with longitudinal axis of skull, standing out to plane of tip of mastoid process, not expanded near middle.

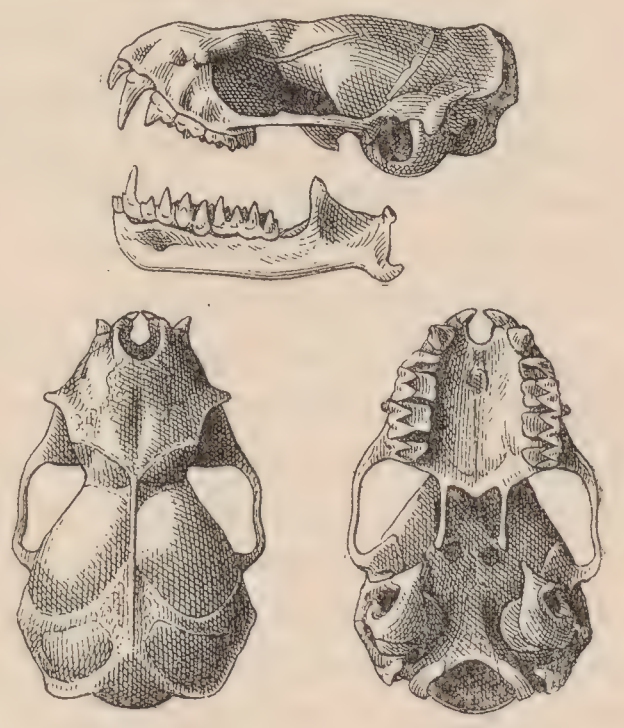


Fig. 1. Skull of *Nyctinomus minutus*. Type. (× 2.)

Mandible heavily built relatively to its length, considerably deeper at base of canine than immediately behind last molar. Coronoid process high and narrow, strongly deflected outward, the distance from its tip to extremity of articular process equal to that from its tip directly downward to lower edge of ramus. Articular process small. Angular process longer than broad, directed strongly downward and backward and slightly outward, the tip a little thickened.

Teeth.—The teeth of *Nyctinomus minutus* are rather more heavily built relatively to the size of the skull than in the larger members of the genus. Except in the absence of the minute outer mandibular incisor and anterior upper premolar the dentition shows no very conspicuous peculiarities.

Upper incisors irregularly triangular-cylindrical in cross section, wide apart at base, strongly converging at tips, their bases separated from bases of canines by spaces about equal to diameter of incisor at middle. Canines triangular in cross-section at base, with strongly developed anterior-internal cutting edge, and a prominent cingulum which develops a small, low, posterior cusp. Premolar large, its tip in line with tip of canine and points of molars, its posterior border overhung by anterior border of first molar. It is separated from canine by a space slightly narrower than that between the latter and the incisor. First and second molar crowns broad and short, the first especially so. Posterior borders very slightly excavated. Third molar nearly as broad as narrowest part of second.

Lower incisors very small and simple, their tips without distinct trace of lobation. A very narrow space between inner incisor and canine. First lower premolar much shorter than second, but discrepancy in area of base much less than that in height. Both teeth are crowded into space between canine and first molar; and the crown of each is roughly triangular in outline, with its longest diameter directed forward and outward. The lower molars show no characters of importance. They slightly decrease in size from first to third.

Measurements.—External measurements of type: Total length, 74; tail vertebræ, 28; tibia, 9; foot, 6; forearm, 29; thumb, 6; second finger, 25; third finger, 56; fourth finger, 47; fifth finger, 33; ear from meatus, 12.4; ear from crown, 10; width of ear, 12; tragus, 4. External measurements of adult female from type locality: Total length, 75; tail vertebræ, 27; tibia, 10; foot, 5; forearm, 30; thumb, 7; second finger, 27; third finger, 56; fourth finger, 45; fifth finger, 33; ear from meatus, 12.4; ear from crown, 10; width of ear, 12; tragus, 4.

Cranial measurements of adult female from type locality: Greatest length, 13.4; basal length, 12.6; basilar length, 10.4; zygomatic breadth, 8.6; mastoid breadth, 8.4; breadth across lachrymal processes, 6.4; width of brain case above root of zygomata, 7; interorbital constriction, 3.4; palatal length, 5; palatal width between posterior molars, 3.4; palatal depth (at middle of molar series), 2; occipital depth, 4.6; upper toothrow (exclusive of incisors), 5; mandible, 9.6; lower toothrow (exclusive of incisors), 6.

Specimens examined.—Two, both from the type locality.

Remarks.—*Nyctinomus minutus* needs no close comparison with the common Cuban member of the genus (a species closely related to *N. cynocephalus*), from which its dental formula, small size, and pointed ears at once distinguish it. Its only near relative is *Nyctinomus kalinowskii* Thomas,[1] an inhabitant of central Peru. This species, however, is larger (total length, 84; forearm, 34.5), the inner margins of the ears arise from the same point on forehead, and, so far as can be judged from the original description, it lacks the conspicuous pad at base of thumb.

Saccopteryx perspicillifer, sp. nov.

1893. *Saccopteryx bilineata* Thomas, Journ. Trinidad Field Naturalists' Club, I, p. 161. April, 1893 (not of Temminck, 1839).

1893. *Saccopteryx bilineata* Allen & Chapman, Bull. Am. Mus. Nat. Hist., V, p. 205. September 21, 1893.

1897. *Saccopteryx bilineata* Allen & Chapman, Bull. Am. Mus. Nat. Hist., IX, p. 14. February 26, 1897.

Type, adult ♂ (in alcohol), No. 7508, American Museum of Natural History, collected at Caura, Trinidad, April 21, 1894, by Frank M. Chapman. Original number 929.

[1] Proc. Zoöl. Soc., London, 1893, p. 334.

General characters.—Like *Saccopteryx bilineata* (Temminck), but larger (forearm about 48 mm, greatest length of skull about 17.5); skull heavily built, the supraorbital processes relatively broader than in *S. bilineata* and *S. leptura*; tragus strongly bent forward, and earconch marked with conspicuous cross ridges; color apparently as in *S. leptura* (only alcoholic specimens examined).

Muzzle and lips.—The muzzle and lips are as in *S. bilineata*, though the lips appear to be more conspicuously glandular-swollen.

Ears.—The ears are slender above, broad below, and moderately long; laid forward they extend about to extremity of muzzle. Anterior borders arising wide apart on forehead, each immediately behind the base of its corresponding supraorbital process. Anterior border straight from base nearly to tip, immediately below which it is slightly convex, the edge slightly thickened. Tip narrowly rounded off and slightly recurved, owing to convexity of anterior border and concavity of posterior border. Below the terminal concavity the posterior border is straight to about middle, where it bends abruptly outward to form the broad, convex basal lobe. This lobe, the margin of which is slightly thickened, extends practically without interruption to extreme outer base of ear, about 4 mm behind angle of mouth, though a faint concavity below meatus marks the posterior limit of the obsolete antitragus. Inner surface of conch crossed by about sixteen conspicuous cross ridges near posterior border. On the outer surface of the conch these ridges appear as minute though plainly visible grooves.

Tragus blunt and distinctly curved forward. Anterior margin evenly concave from base to tip. Upper margin strongly crenulate, so cut away posteriorly that it merges insensibly into posterior margin without distinct upper posterior angle. Posterior margin faintly concave, then abruptly convex at level of deepest part of anterior concavity. Below this it is nearly straight to base, and parallel with lower half of anterior border.

Membranes.—Membranes as in *S. bilineata*, but wingsac apparently larger.

Feet, tail, and distribution of fur as in *Saccopteryx leptura* and *S. bilineata*.

Color.—A specimen after five years' immersion in alcohol is seal-brown above, wood-brown below, ears and membranes blackish. Dorsal stripes grayish-white, irregular in outline, and showing a tendency to break up into spots.

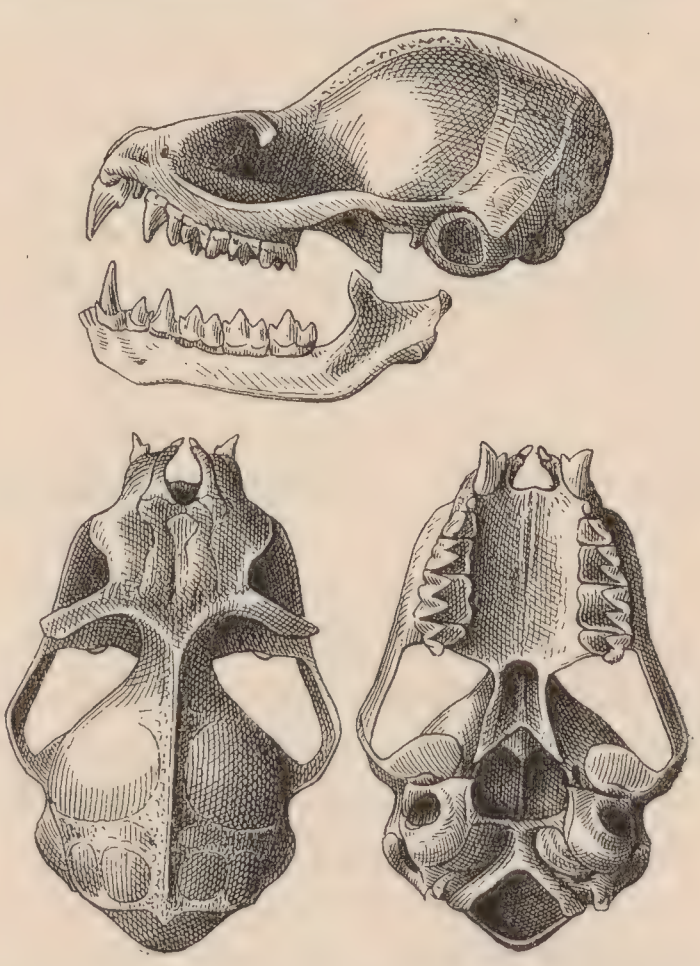


Fig. 2. Skull of *Saccopteryx perspicillifer*. (× 2).

Skull and teeth.—The skull is noticeably larger than that of *S. bilineata*, and

the rostrum is perhaps relatively more heavily built, though the braincase appears more slender. The lachrymal region shows a little more distinct inflation. Supraoccipital processes relatively as well as actually larger and more conspicuous than in any other species of the genus. Sagittal crest high and well developed. Teeth larger than in *S. bilineata*, but not different in form.

Measurements.—External measurements of type: Total length, 70; tail vertebræ, 18; tibia, 22; foot, 9.4; calcar, 18; forearm, 47.5; thumb, 8; second finger, 41; third finger, 82; fourth finger, 59; fifth finger, 58; ear from meatus, 18; ear from crown, 15; width of ear, 12; tragus, 5.4. Average of six specimens (2 ♂ ♂, 4 ♀ ♀): Total length, 72.6 (70–78); tail vertebræ, 18.7 (17–22); tibia, 21.2 (20–22.4); foot, 10.1 (9.4–11); calcar, 18 (17–19); forearm, 47.8 (45–50); thumb, 7.7 (7–8); second finger, 42 (40–45); third finger, 87 (82–90); fourth finger, 60 (58–63); fifth finger, 56 (52–60); ear from meatus, 15.7 (15–18); ear from crown, 13.7 (13–15); width of ear, 11 (10–12); tragus, 4.8 (4–5.4).

Cranial measurements of type: Greatest length, 17.8; basal length, 15.6; basilar length, 13; greatest breadth of rostrum in front of orbits, 6.2; least breadth immediately in front of supraorbital processes, 4.6; least width immediately behind supraorbital processes, 2.6; tip to tip of supraorbital processes, 9.6; zygomatic breadth, 11; mastoid breadth, 9; greatest breadth of braincase, 8; median length of bony palate, 5.6; width of bony palate between posterior molars, 4; occipital depth (exclusive of sagittal crest), 6; depth of rostrum at posterior premolar, 3.4; upper toothrow (exclusive of incisors), 7.4; mandible, 13; lower toothrow (exclusive of incisors), 7.8.

Specimens examined.—Six, all from the island of Trinidad.

Remarks.—This species is readily distinguished from *Saccopteryx bilineata* by its large skull and conspicuous supraorbital processes. So far as known it is confined to the island of Trinidad; but I have examined no material from the immediately adjacent mainland.

Peropteryx trinitatis, sp. nov.

1893. *Saccopteryx canina* THOMAS, Journ. Trinidad Field Naturalists' Club, I, p. 161. April, 1893 (not of Wied, 1826).

1893. *Saccopteryx canina* ALLEN & CHAPMAN, Bull. Am. Mus. Nat. Hist., V, p. 205. September 21, 1893.

1897. *Saccopteryx canina*, ALLEN & CHAPMAN, Bull. Am. Mus. Nat. Hist., IX, p. 14. February 26, 1897.

Type, adult, ♀ (in alcohol), No. 7496 American Museum of Natural History, collected at Port of Spain, Trinidad, April 27, 1894, by Frank M. Chapman. Original number, 956.

General characters.—Like *Peropteryx canina* (Wied) but much smaller (forearm, 40, greatest length of skull, 13).

Muzzle and lips.—Muzzle broadly conical; distance from incisor to nostril, 3 mm. Nostrils at extremity of muzzle opening forward, downward, and very slightly outward, the distance between their outer borders about 2 mm. They are separated by a deep groove which is especially conspicuous when the muzzle is viewed from above and behind. Lips broad and ample, both upper and lower noticeably glandular-swollen. Middle of upper lip with a large wart, deeply cleft from behind. When mouth is closed this wart fits between the swollen margins of the well developed groove at extremity of lower lip. Inner surface of both upper and lower lips marked with fine transverse wrinkles.

Ears.—The ears are large and broad, only slightly narrowed toward tip. Their anterior bases are about 2 mm apart, and about 3 mm above eye. Anterior border straight from base to middle, where there is a faint convexity; then straight to narrowly rounded off tip. Posterior border straight from tip to middle, then moderately convex to shallow notch opposite posterior base of tragus. Below this notch is the short, narrow, evenly convex antitragus, which terminates 3 mm behind angle of mouth. Inner surface of conch without cross striations.

Tragus straight, the tip rounded; width at base a little less than half height. Anterior border straight except for a very slight concavity immediately above base. Posterior border slightly concave to broadest point, opposite anterior base, this point marked by a slight projection; then straight to posterior base. The outline of the tragus is entire throughout.

Feet.—The foot is slender and weak, less than half as long as tibia. Toes scarcely longer than metatarsus, wholly destitute of basal membrane. First and fifth digits equal and slightly shorter than the others. Calcar slender, slightly shorter than tibia, terminating rather indistinctly.

Tail.—Tail short, about as long as femur, the terminal fifth free from membrane. Caudal vertebræ five.

Membranes.—Membranes thin, broad and ample. Wing attached at extremity of tibia. Uropatagium about as long as outstretched leg without foot, its free border shorter than calcar. Propatagium large, continued outward along forearm as a narrow fold including metacarpal of thumb.

Wingsacs.—The wingsacs when fully formed are about 5 mm in length. The inner surface of the sac is for the most part smooth, but it is crossed by a conspicuous longitudinal fold near side toward body.

Fur and color.—The fur is soft and loose in texture, that on middle of back about 8 mm in length. It extends on both surfaces of wings to line joining middle of humerus with middle of femur. This band is continued forward across base of propatagium. Uropatagium thinly haired throughout, the hairs most numerous near tail on dorsal surface and along veins on lower surface. The fur of the head covers lower half of outer surface of ears. The face in front of and below ears, and the lower jaws, chin, etc., are naked except for a sparse sprinkling of fine hairs.

Color of a specimen, preserved in alcohol for five years, dull sepia throughout, the hairs paler at base. Ears and membranes dark brown.

Skull.—The skull of *Peropteryx trinitatis* is small and lightly built—slightly

smaller than that of *Saccopteryx leptura*. Rostrum slightly broader than long, the dorsal surface rounding from all sides toward the middle except at interorbital constriction where it is slightly hollowed. Broadest part of rostrum immediately back of external nares, whence the straight sides slope inward and backward to interorbital constriction, the three sides forming an isosceles triangle, broken only by the slight anterior projection of the maxillaries, which forms the walls of the anterior nares and supports the canines—upper surface horizontal from external nares to proencephalon. Supraorbital processes straight, horizontal or bent downward, short, and weak. They form the roof of from one third to two thirds of the upper-posterior rim of orbit. Lower orbital rim noticeably flaring, and lachrymal region and maxillary in front of orbit distinctly inflated. Antorbital foramen very minute, opening forward and outward over anterior root of large premolar; much smaller than lachrymal foramen, which opens upward and outward above and slightly behind it. Interorbital region broadly hourglass-shaped, very narrow in the middle, its narrowness exaggerated by the abrupt contrast with the braincase and rostrum. Braincase short egg-shaped in outline when viewed from above. Sagittal crest rudimentary. Zygomata narrow and weak, widest apart opposite glenoid surface, where they stand out slightly beyond braincase and mastoid region. Pterygoids short, very strongly divergent posteriorly. Basisphenoid pits perfectly confluent and without trace of median septum.

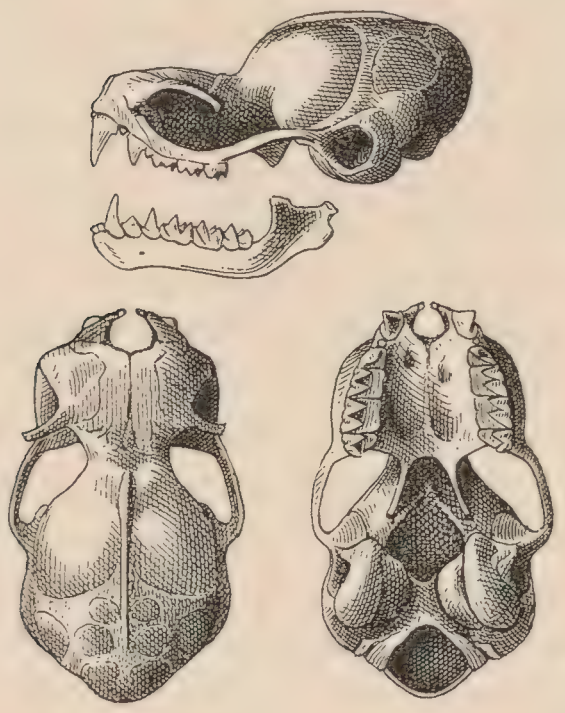


Fig. 3. Skull of *Peropteryx trinitatis*. Type. (× 2.)

Teeth.—The teeth of *Peropteryx trinitatis* are large relatively to the size of the skull. Upper incisors minute, scarcely larger than inner cusp of canine. First upper premolar even smaller than incisor, closely crowded against posterior base of canine, but separated from large second premolar by a distinct space.

Measurements.—External measurements of type: Total length, 60; tail vertebræ, 14.4; tibia, 18; foot, 6.4; calcar, 17; forearm, 41; thumb, 7; second finger, 34; third finger, 72; fourth finger, 49; fifth finger, 47; ear from meatus, 15; ear from crown, 12; width of ear, 11; tragus, 5. Average measurements of five specimens (2 ♂ ♂, 3 ♀ ♀) from the type locality: Total length, 59 (57–60); tail vertebræ, 13.4 (13–14.4); tibia, 16.7 (16–18); foot, 6.3 (6–7); calcar, 15.4 (14–17); forearm, 40 (39–41); thumb, 6.5 (6–7); second finger, 32.6 (31–34); third finger, 69 (68–72); fourth finger, 48 (47–49); fifth finger, 46 (45–47); ear from meatus, 14 (13–15); ear from crown, 12.2 (12–13); width of ear, 11; tragus, 4.9 (4–5.4).

Cranial measurements of type: Greatest length, 13.8; basal length, 12;

basilar length, 10 ; greatest breadth of rostrum in front of orbits, 6 ; least breadth immediately in front of supraorbital processes, 4.8 ; least breadth immediately behind supraorbital processes, 2.6 ; tip to tip of supraorbital processes, 7 ; zygomatic breadth, 8 ; mastoid breadth, 7.4 ; greatest breadth of braincase, 6.4 ; median length of bony palate, 4 ; width of bony palate between posterior molars, 3.2 ; occipital depth, 5 ; depth of rostrum at base of second premolar, 1.8 ; upper toothrow (exclusive of incisors), 5.4 ; mandible, 9.4 ; mandibular toothrow (exclusive of incisors), 5.6.

Specimens examined.—Six, all from the type locality.

Remarks.—Peropteryx trinitatis is readily distinguishable from *P. canina* and *P. kappleri* by its small size (forearm 40 instead of 45 and 50 respectively) and short tibia.

Article XIII.—OBSERVATIONS ON SOME "MUD FLOW" MARKINGS ON ROCKS FROM NEAR ALBANY, N. Y., NOW IN THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK.

By R. P. Whitfield.

Among the various forms of mud marking, burrows of various animals, and peculiar plant remains, found on rock surfaces, which have excited the curiosity of various writers in their endeavor to explain their origin, there is one form which, so far as I am aware, has not yet been explained. This form is that usually referred to as representing 'flowing mud' and often closely simulates the flow of slag from an iron furnace, or the surface of lava flows.

Prof. J. Hall read a paper before the Association of American Geologists in 1842, and subsequently repeated it in the Geol. 4th Dist. N. Y., 1843, p. 233, in which he mentions markings of this character from the Portage Group of New York. These, however, are on horizontally stratified rocks, entirely undisturbed and unaltered, consequently showing no reason for the mud composing them to flow.

On the surface of the semi-metamorphic rocks at Kenwood, near Albany, N. Y., and in close connection with the Utica Slate Graptolite bed of that locality, where the disturbance has been very great, so that the layers are curved, distorted, and much broken up, there occur many very beautiful examples of these 'flowing mud' forms, varying from fine sculpturings to rounded ridges of ten or more inches in width.

The three figures here given represent three of the best examples seen from this locality, reduced to about one-eighth their natural size; the smaller one being more imitative in its character than the two larger ones.

The rocks at this locality are much disturbed and distorted, folded and plicated to crushing, often to the degree of comminution, and are composed of mud shales alternating with arenaceous limestone layers known as 'bluestone,' and extensively used as a rough building stone.

The areas covered by these markings are seldom of great extent, nor are they confined to the "thinning out edges" of

No. 1. $\frac{1}{8}$ nat. size.

layers, as intimated by Prof. Hall to be the case in the Portage Group; but are common to many of the harder layers, irrespective of thickness or position, other than that the marked surface

is invariably bedded against a layer of fine mud shale which is compactly imbedded into all the depressions of the sculpturing.

This sculpturing of the surface is confined to the hard layers, and appears to be invariably on the *under* side of the layer; and

No. 2. $\frac{1}{8}$ nat size.

to be a mould of a sculpturing produced by some sort of action on the surface of the soft muddy layer below it, which has been filled by the deposit of sandy material producing the harder stone.

By studying the occurrence of these markings, during frequent visits to the locality, I am convinced that they are on the *under sur-*

face[1] of the layer. This view I find is confirmed by Prof. Hall, in speaking of those of the Western New York Portage.

That these features are not uncommon on rock surface may be inferred from numerous mentions that have been made of them. J. P. Lesley,[2] refers to them as common on the Portage and Chemung rocks of Pennsylvania at several localities. Dr. D. D. Owen in the Geology of Wisconsin, Iowa, and Minnesota figures a similar form as coming from the red sandstones on the northwest shore of Lake Superior.[3]

No. 3. $\frac{1}{8}$ nat. size.

None of the authors appears to give any very reasonable explanation of the formation of these peculiar features, but all refer to them as "flowing mud," and Prof. Hall likens them to the surface produced on "flowing cinders from an iron furnace," which they certainly closely resemble.

[1] Trans. Assoc. of Am. Geologists and Naturalists, 1840–1842, pp. 422 *et seq.*

[2] 2d Geol. Surv. Penn. Dictionary of Fossils (P. 4), Vol. I, p. 424.

[3] Atlas, Tab. 1D, fig. 1.

Some years ago a form very similar to the smaller of the three specimens here figured, but very much smaller in dimensions, from the Pipe Stone beds of Pipe Stone Co., Minn., was described as a trilobite, under the name *Paradoxides barberi*, and many imitative forms could be found if one's imagination were exercised sufficiently. But there is no evidence of any organic structure connected with any that have come under my observation. Their close resemblance to flowing lava, or to the surface of flowing slag from a blast-furnace, is so perfect, that the most casual observer is struck with it at once. But still this does not appear to be a rational explanation, for if, as is apparent, they are on the under side of the hard layers, the mould into which these low reliefs were cast was in the soft mud forming the shale, and must have been a depression. The hard rock substance contains no internal evidence of these embossed figures; neither does the soft shale present, in its lamination, any evidence of separating in the form of the figures, but on the contrary flakes parallel to the line of bedding, *i. e.*, the stratification of the mass. Consequently no clew to the mode of formation is afforded from the objects themselves, and from the surroundings and conditions, the theory of flowing or moving mud does not seem tenable; for if, as seems to be the case, the embossed surface is the under side of the hard rock a flow would not produce this result. They may be due to the lateral compression to which the layers have been subjected, causing a wrinkling of the surface. But here there is more than a wrinkling and a distinct flow feature produced which is difficult to explain by any theory of pressure.

Article XIV.—NOTE ON A CALCITE GROUP FROM BISBEE, ARIZONA.

By E. O. Hovey.

Plate VIII.

Among the many handsome specimens received by the American Museum of Natural History from the mines of the Copper Queen Consolidated Mining Co., at Bisbee, Arizona, one of the most peculiar is the group of calcite crystals, two views of which are given on the plate accompanying this note. The planes represented on the crystals are few in number and the combinations are simple enough, but the result is an uncommon one and is of such a character that it seems to be worth while to make a record of it.

The planes present are the base *c* (0001, *O*), the rhombohedron *M* ($40\bar{4}1$, + 4 *R*), and the rhombohedron *f* ($02\bar{2}1$, − 2 *R*). The planes *M* and *c* are present on only a few of the crystals, *f* being the predominant form. *M* is highly polished, *c* is less brilliant, while *f* is dull or etched and is usually curved or otherwise distorted. The small crystals in the group show a comparatively uniform development of the planes composing them, but the larger ones are strongly prismatic or columnar in two ways. One set, and that much the most numerous, is made up of single crystals elongated on the rhombohedral axis of the form *f*, forming a prism the acute angle of which varies from 76° to 80°, as measured by a contact goniometer, the calculated value being 78° 51′ (Dana). This is the simplest form, since it shows but the one rhombohedron *f*. The other set is composed of combinations of crystals showing the same rhombohedron built up on the vertical axis and terminated at the top by a small basal plane. The prisms of this set are much stouter in form than those of the other, but they are much less numerous. The best developed column is the larger of the two prominent ones shown in the figures on the plate and is of this set, the smaller of these belonging to the first set. A few large crystals made up of the rhombohedron *f* in normal development show the basal plane *c* and the rhombohedron *M*.

At several places the crystals are grouped with their basal planes nearly at right angles to one another, but their cleavage planes are not coincident and therefore such groups cannot be regarded as twins according to the third law (twinning plane the unit rhombohedron). Around the bases of the large crystals and the columns there are numerous small crystals composed of the rhombohedron *f* and the base, and the under surface of the specimen, as shown on the plate, is coated with such crystals. It is evident that the specimen was attached to its surroundings by the edge. In size the group is about 62 cm. (2 feet) long, 41 cm. (16 inches) wide, and 8 cm. (13 inches) high.

Calcite Group, *Bisbee, Ariz.*

Opposite views.

THE HELIOTYPE PRINTING CO., BOSTON.

Article XV.—NOTICE OF TWO VERY LARGE LOBSTERS IN THE COLLECTION OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

By R. P. Whitfield.

Plate IX.

The Museum received two unusually large specimens of the common marine Lobster, *Homarus americanus* DeKay, during the spring of 1897, both of which were captured off Atlantic Highlands, N. J., by fishermen engaged in that business, and within a short time of each other.

The two individuals, although of exceptionally large size, vary but little in their dimensions. The weight of the larger one, while living, was about 34 pounds, and of the smaller one about 31 pounds.

The smaller one came into possession of Mr. Alfred Cabassud, who at the time had a restaurant in Lower Broadway, and who presented it to the Museum; the larger one was exhibited at the Castle Garden Aquarium for a time, but neither survived more than a few days, and afterward both were prepared and mounted for permanent preservation.

The unusual size of these specimens has been thought worthy of notice, and a series of measurements has been made of them and given below, one while in a fresh state, the other, after drying and mounting, during which process considerable shrinkage took place.

Lobsters, like all Crustaceans, are subject to many abnormalities and accidents during growth and in moulting, and in consequence specimens are often found with abnormally developed parts. One example in the Museum collection shows a double right-hand claw, while all other parts are normally developed. These two large individuals, although of such unusual size, appear to be quite normal in all parts, being simply overgrown.

The first set of the following measurements was made by Dr. E. O. Hovey, of the Museum, from the specimens after mounting, and shows the differences between the two individuals. The

other set was made from the larger one, while still fresh, but just after death, by J. B. Briggs, Jr., of the New York University, class of '98, under the direction of Prof. C. L. Bristol. The first set was made in millimetres, while that of Mr. Briggs was made in inches and has been reduced to millimetres.

	No. 1. MM.	No. 2. MM.
Length of carapace, including rostrum, along median line	257	280
Circumference of carapace behind second pair of legs	268	486
Length of abdomen to point of telson	300	311
Breadth of tail	230	223
Large chelate limbs : right side, length of first two joints	160	165
" " " third joint	120	122
" " " fourth joint	360	365
" " " thumb	145	201
" circumference of third joint	236	248
" " " fourth "	442	348
" length of whole limb	570	610
left side, length of first two joints	171	183
" " " third joint	118	124
" " " fourth joint	360	375
" " " thumb	198	155
" " " whole limb	580	615
" circumference of third joint	237	263
" " " fourth "	339	491
Entire length as mounted	920	1005

Length of antennæ exceeds 400 mm.

The right limb bears the crushing claw in No. 1, but the left limb bears it in No. 2. The weight of No. 1 when caught was said to be 31 pounds ; that of No. 2 was said to be 34 pounds.

Measurements of No. 2, made by J. B. Briggs, Jr.

	INCHES.	MM.
Total length, rostrum to end of telson, not including hairs	$23\frac{3}{4}$	603
CARAPACE :		
Length of rostrum	$2\frac{5}{16}$	59
" " carapace	$9\frac{3}{4}$	248
" " " including rostrum	$11\frac{1}{16}$	306
Distance from cervical groove to posterior edge of carapace	$4\frac{9}{16}$	116
Breadth between spines, near base of rostrum	$1\frac{9}{16}$	40
Breadth between spines, near base of second antenna	$2\frac{12}{16}$	70
Girth of carapace behind cervical groove	$19\frac{3}{4}$	502

	INCHES.	MM.
PLEON:		
Length of second segment (including facet)	$2\frac{1}{16}$	52
Breadth " "	$4\frac{9}{16}$	116
Girth " " (spine to spine)	$14\frac{1}{2}$	267
Length of sixth segment (including facet)	$1\frac{4}{16}$	22
Breadth " "	$4\frac{7}{16}$	113
Length of telson (not including setæ)	$2\frac{12}{16}$	70
Breadth " at base	$2\frac{15}{16}$	75
ANTENNÆ:		
Length of stalk of first antenna	$1\frac{4}{16}$	32
" " basal segment	1	25
Breadth of basal segment	$\frac{10}{16}$	16
Length of eyestalk	$\frac{10}{16}$	16
Breadth "	$\frac{8}{16}$	13
Length of stalk of second antenna	$2\frac{3}{16}$	56
Length of exopodite (scale)	$\frac{14}{16}$	22
Greatest width	$\frac{9}{16}$	14
PEREIOPODS:		
Large forceps (crushing claws):		
Length of propodus (straight measurement)	15	381
Greatest breadth of propodus at articulation with dactyl	$7\frac{10}{16}$	194
Girth of propodus just behind articulation of dactyl	$20\frac{1}{2}$	521
Length of dactyl	$6\frac{3}{16}$	157
Greatest breadth of dactyl	$3\frac{2}{16}$	79
" girth " "	$9\frac{1}{2}$	241
Length of carpus (on inner margin, not including proximal spine)	$4\frac{7}{16}$	113
Greatest breadth of carpus	$3\frac{3}{8}$	86
" girth " "	12	305
Length of meros (outer border)	$5\frac{10}{16}$	143
Breadth "	$3\frac{12}{16}$	95
Small forceps:		
Length of propodus (from tip to spine near proximal end)	$15\frac{1}{2}$	394
Breadth of propodus	$5\frac{10}{16}$	143
Girth " "	$15\frac{1}{4}$	387
Length of dactyl	$7\frac{15}{16}$	202
Greatest breadth of dactyl	2	51
" girth " "	$6\frac{3}{4}$	171
Length of carpus (on inner margin, not including proximal spine)	$4\frac{1}{16}$	103
Greatest breadth of carpus	$3\frac{7}{16}$	87
" girth " "	$11\frac{1}{4}$	284
Length of meros (outer border)	$5\frac{7}{16}$	138
Greatest breadth of meros	$4\frac{4}{16}$	108

	INCHES.	MM.
Second and fifth pereiopods :		
Length of propodus, second pereiopod	$3\frac{9}{16}$	90
Breadth at articulation of dactyl	$1\frac{3}{16}$	30
Length of dactyl	$2\frac{12}{16}$	70
Breadth " (at articulation)	$\frac{10}{16}$	16
Greatest length of carpus	$2\frac{8}{16}$	63
Breadth of carpus (second pereiopod)	$1\frac{2}{16}$	28
Length of dactyl (fifth pereiopod)	1	25
Breadth of dactyl (fifth pereiopod)	$\frac{8}{16}$	13
Length of propodus	$2\frac{13}{16}$	71
Breadth " (dist. ext.)	$\frac{12}{16}$	19
" " (prox. ")	$\frac{12}{16}$	19
Length of carpus	$1\frac{12}{16}$	44
Breadth "	$\frac{11}{16}$	17
PLEOPODS :		
Length of first pleopod	$2\frac{13}{16}$	71
" " distal segment	$1\frac{12}{16}$	44
Greatest breadth of distal segment	$\frac{11}{16}$	17
Length of stalk of second pleopod	$1\frac{10}{16}$	41
Breadth " " " "	$\frac{12}{16}$	19
Length of exopodite	$1\frac{12}{16}$	44
Breadth "	$\frac{9}{16}$	14
Length of exopodite, sixth pleopod, from an angle between spines of protopodite	$3\frac{5}{16}$	84
Greatest breadth of exopodite at hinge, sixth pleopod	$2\frac{12}{16}$	70
Length of endopodite (sixth pleopod)	$2\frac{6}{16}$	60
Greatest breadth " " "	$2\frac{8}{16}$	63

Homarus Americanus *DeKay*.

From off Atlantic Highlands, N. J.

THE HELIOTYPE PRINTING CO., BOSTON.

Article XVI.—NEW RODENTS FROM COLOMBIA AND VENEZUELA.

By J. A. Allen.

Through the liberality of Mr. Morris K. Jesup, President of the American Museum of Natural History, the Museum has been placed in possession of one of the most extensive and best prepared collections of mammals that has probably ever been brought together from a single limited locality in South America. This collection has been made mainly in the vicinity of Santa Marta, Colombia, in the coast region below an altitude of 500 feet; a part, however, was collected in the lower portion of the Sierra region, at altitudes varying from 4000 to 6000 feet. The collection was made under the direction of Mr. Herbert H. Smith, the well-known natural history explorer who has done so much excellent work, under various auspices, in Southern Brazil, in the West Indies, and in Mexico, by his wife, equally well known as an expert zoölogical collector, aided by a corps of assistants. Through the aid of Mr. Jesup, the Museum has purchased all except the duplicates of this collection, which latter, however, are still at the Museum, and, with Mr. Smith's generous consent, will be used as the basis of a later report on the mammals of the Santa Marta district. In the present paper only the Rodents receive treatment, and these only so far as to make known the forms that appear to be new. Mr. Jesup has also purchased for the Museum Mr. Smith's collection of birds thus far made in the same region, numbering upward of 3000 specimens.

The Venezuelan forms here described are from a small collection of mammals made by Mr. F. W. Urich, in the mountainous district situated about ninety miles from Cumana. This collection, numbering only about 75 specimens, proved of special interest, as, though not numerous in species, it contained several not previously described, as did also a small collection of birds made by Mr. Urich at the same localities and received with the mammals.[1]

The external measurements given, when not otherwise stated, are those made by the collector from the fresh specimens.

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[1] See *antea*, pp. 153–156.

Lepus (Sylvilagus) superciliaris, sp. nov.

Type, No. 15428, ♂ ad., Bonda, Santa Marta District, Colombia, July 4, 1899 ; Coll. H. H. Smith.

Color above pale buff, strongly varied with black, which in some specimens is quite the predominant color of the dorsal area ; sides rather paler with much less black ; nape patch rich rufous ; frontal region, from the nose to a point opposite the posterior canthus of the eyes, deep rusty chestnut, with, or wholly without (in different specimens), a slight admixture of black-tipped hairs ; crown paler rufous varied with black ; sides of the nose and cheeks buffy white, more strongly colored and varied with blackish on the latter ; a broad very distinct grayish-white ocular stripe, very narrow below the eye, broader and clearer above the eye, and forming a broad whitish patch both in front of and behind the eye ; an indistinct blackish area midway between the eye and base of the ear ; eyelashes black, the upper very long, thick, and intense black ; above the ocular stripe is a very distinct narrow black stripe, separating the broad gray ocular stripe from the rufous of the frontal region ; ventral surface including inside of limbs, pure white to the base of the fur ; broad chest band strong buff, the fur pale gray at the extreme base ; whole throat and chin white, like the abdomen, but the pelage shorter ; fore limbs anteriorly pale rufous, passing into white or buffy white on the feet ; hind limbs clear rufous postero-externally, passing into buff on the antero-internal border ; top of hind feet white, sides buff mixed with white, especially on the inner edge, more deeply buff or pale rufous on outer edge ; soles dingy buff, the fur more grayish basally ; tail pure white below, above dull rufous, the hairs blackish below the surface, thus often giving a dingy rufous general effect ; ears large, thinly haired, whitish gray at extreme base posteriorly, passing gradually to blackish on the apical third, with a narrow edging of pure white ; the antero-exterior third is more heavily clothed and grayish buff, the buffy tint strongest at the base of the ear and passing gradually into blackish apically.

Young in first pelage resemble the adults in all details of markings and color, except that the dorsal area is more strongly varied with black, with a tendency to a median blackish area, shown also in some of the adults.

Measurements.—Type, total length, 400 mm. ; tail vertebræ, 25 ; hind foot, 75, with claws, 87 ; ear (in dry skin), from notch, 55, from top of head, 72. Five adults measure as follows : total length, 394 (375–410) ; tail vertebræ, 31 (25–33) ; hind foot (with claws), 93 (87–100) ; ear (in dry skin) from notch, 53, from top of head, 65.

Skull, total length, 79 ; basal length, 59 ; greatest (zygomatic) width, 35.5 ; mastoid width, 26 ; interorbital width, 18 ; intertemporal width, 24 ; length of nasals, 33 ; width of nasals at base, 16 ; palatal floor, 7.5 ; from henselion to posterior border of palatines, 28.5 ; palatine foramina, 20 x 5.5 ; upper tooth-row, crown surface, 12, at alveolar border, 14 ; lower jaw, condyle to incisor tips, 59 ; height at condyle, 32.

This species is based on 11 specimens, 5 adult and 6 young, the latter of various ages, but mostly less than one fourth grown,

all taken at or near Bonda. They vary but little in coloration, —the adults mainly in the buff tint of the upper parts, which ranges from strong buff to pale buffy white.

Lepus superciliaris belongs to the *Sylvilagus* group of *Lepus*, and to the section represented by *L. insolitus* Allen of Colima, Mexico, with which it agrees in the general conformation of the skull, and especially in the deep grooving of the external face of the malar. It hence has no close relation to the subgenus *Tapeti*. It should be compared with *Lepus cumanicus* Thomas, from Cumana, Venezuela, which is doubtless its nearest ally, and with which it closely agrees in size and in general features. *L. cumanicus*, judging from the description, is much paler, and if the conspicuous black superciliary stripe so characteristic of the Bonda form is present in *cumanensis* it is not mentioned in the detailed description of the species. Also the deep clear rufous of the frontal region of the head in *L. superciliaris* is not mentioned in the account of *cumanensis*. The geographical and faunal relations of Bonda and Cumana, as indicated by the representation of other groups of Rodents in the two regions, point to at least a subspecific differentiation in the Hares of the two localities.

Isothrix rufodorsalis, sp. nov.

Type, No. 14606, ♂ ad., Onaca, Santa Marta District, Colombia, Dec. 24, 1898; Coll. H. H. Smith.

Pelage very soft, almost woolly, full and long. Color of dorsal area deep rufous, paler yellowish rufous on the sides, including sides of head to the nose; a few long black-tipped hairs on the top of the head and nape; below, including inner surface of limbs, fulvous, passing insensibly into the color of the sides; whiskers, a tuft of long bristles between the eye and ear, and a tuft of long hairs at the inner base of the ear, intense black; ears small, pale brown, naked externally, but with numerous long hairs from the inner surface; upper surface of fore and hind feet pale fulvous gray; tail heavily haired throughout, basal three-fifths black, terminal two-fifths pure white.

Measurements.—Type (and only specimen), total length, 457 mm.; tail vertebræ, 267; hind foot, without claws, 35, with claws, 40; ear, 12. (Foot and ear measured from dry skin.)

Skull, total length, 52.5; basal length, 40; zygomatic width, 24.5; mastoid width, 21; interorbital width, 24; length of nasals, 15; width of nasals at middle, 5; crown length of upper toothrow, 5.8; palatal length, 5.3; length of lower toothrow, 5.3.

This very interesting species is based on a single specimen from Onaca. The pelage is very soft and full, the tail heavily

clothed, black for the greater part of its length and pure white for the terminal two-fifths. The ears are very small, tufted with long hairs on the inner surface ; hind feet very short and broad. The skull is short and broad, the zygoma heavy and broad but not arched laterally, and the supraorbital edges of the skull are greatly developed, with straight external borders, the interorbital region being thus very broad with nearly parallel edges. The facial portion of the skull is extremely short, the distance between the incisors and the molar series being a little less than the length of the crown surface of the upper toothrow. The teeth are much worn, but indicate a tooth pattern closely like that figured by Günther for his *Lasiuromys villosus* (Deville), with which the general character of the skull agrees (*cf.* P. Z. S., 1876, 744, fig. 5). *Isothrix rufodorsalis*, however, appears on the whole to be very distinct from any of the other described members of the *Isothrix* group.

Echimys mincæ, sp. nov.

Type, No. 15389, ♂ ad., Minca, Santa Marta District, Colombia, July 19, 1899 ; Coll. H. H. Smith.

General color above strong golden brown, lined with black, the pelage of the dorsal area consisting of yellowish brown hairs abundantly intermixed with grooved, black-tipped spines, which appear at the surface as blackish points ; sides lighter and less varied with black, the yellowish brown hairs composing most of the pelage, with a few black-tipped bristly hairs intermixed ; beneath, pure white, including inside of limbs, the pelage rather soft and wholly without spines ; sides of the head lighter and more grayish than the sides of the body ; top of head darker than the back, being more mixed with blackish ; outer surface of the fore limbs gray tinged with yellowish, becoming whitish on the upper surface of the feet ; hind limbs externally like the sides of the body, but upper surface of the feet whitish, varying from grayish white to nearly pure white ; ears of medium size, oval, rounded at top, and covered externally with very fine short hairs, more sparsely clothed within ; tail sharply bicolor, blackish above, nearly white below, clothed for an inch at the base with soft hairs like those of the adjoining parts of the body, the rest of the tail sparsely covered with very short hairs, imperfectly concealing the annulations.

Young in first pelage, uniform blackish brown above, pure white below. The pelage of the median area of the back is stiff and bristly, the spines in part grooved, but thinner and weaker than in the adult pelage.

Measurements.—Type, total length, 456 mm.; tail vertebræ, 210 ; hind foot, without claws, 50, with claws, 57. Twenty adult males and 14 adult females measure as follows : 20 males, total length, 437 (400–490) ; tail vertebræ, 202 (186–224) ; hind foot (with claws), 51 (46–57) : 14 females, total length, 413 (380–440) ; tail vertebræ, 194 (170–210) ; hind foot (with claws), 46 (42–50).

Skull (of type), total length, 60; basal length, 47; zygomatic width, 27; mastoid width, 21; interorbital width, 13; length of nasals, 23; width of nasals at middle, 6.3; crown length of upper toothrow, 8.5; palatal length, 8.5; length of lower toothrow, 9.2.

This species is based on 102 specimens, of which 87 were taken at Minca and 15 at Bonda; the series includes quite a number of young of various ages, ranging from those in first pelage to young adults.

Echimys mincæ belongs to the same group as *E. trinitatis*, having the same pure white belly, the same general proportions, and practically the same dentition. It is, however, very much smaller and very different in coloration, being golden brown above instead of dark chestnut brown.

Echimys urichi, sp. nov.

Type, No. 14798, ♂ ad., Quebrada Secca, Venezuela, Nov. 23, 1898; F. W. Urich.

Similar in color and proportions to *E. trinitatis*, but much smaller.

Measurements.—Type, total length, 370 mm.; tail vertebræ, 171; hind foot, 43, with claws, 46; ear, 25. Ten adult males measure as follows: total length, 390 (344–409); tail vertebræ, 162 (140–186); hind foot, 44 (42–46); ear, 25 (24–27). Two adult females average slightly less.

Skull, type, total length, 48; basal length, 33; zygomatic width, 23; mastoid width, 20; interorbital width, 10.3; length of nasals, 16; width of nasals at middle, 4.5; crown length of upper toothrow, 8; palatal length, 8; length of lower toothrow, 8.6.

Named in honor of Mr. F. W. Urich, so well known through his natural history work in Venezuela and Trinidad.

This is an almost exact miniature of *E. trinitatis*, but the difference in size is so great that the separation seems unquestionably necessary, *E. urichi* being nearly one third smaller than *E. trinitatis*. The comparative measurements of *E. trinitatis*, *E. mincæ*, and *E. urichi* are shown in the following table, based on adult male specimens, from which it appears that the largest specimens of *E. urichi* do not very closely approach even the smallest specimens of *E. trinitatis*.

	No. of Specimens.	Total Length.	Tail Vertebræ.	Hind Foot.	Ear.
E. trinitatis....	10	469 (440–510)	211 (185–230)	53.3 (51–55)	27 (21–31)
E. mincæ.....	20	437 (400–490)	202 (186–224)	51 (46–57)	
E. urichi.....	10	390 (344–409)	162 (140–186)	44 (42–46)	25 (24–27)

In *E. urichi* the spines are weaker than in *E. trinitatis*, and are confined to a much narrower tract of the median dorsal area.

E. urichi is based on a series of 21 specimens collected at Los Palmales and Quebrada Secca, near the northern coast of Venezuela, 90 miles south of Cumana, at elevations of 2000 to 4000 feet, in November and December, 1898. About one half the specimens are fully adult, and the remainder 'young adults,' there being no very young specimens in the series.

Echimys canicollis, sp. nov.

Type, No. 15397, ♂ ad., Bonda, Santa Marta District, Colombia, April 20, 1899; Coll. H. H. Smith.

Pelage of the dorsal region hispid, sparsely intermixed with weak slightly grooved spines; pelage of the sides and underparts softer but hairy and not furry. Color of the upper parts, from the nape posteriorly to the rump, rather pale yellowish brown, or pale golden brown, varied over the back with black-tipped spines or spiny hairs, paler and grayer on the sides, including the region at the base of the tail; top of head and nape grayish, varied with black; sides of head and sides of neck rather clear gray, becoming paler on the cheeks; lower parts and inside of limbs white, the gray of the sides of the neck extending on to the sides of the throat, and sometimes (especially in immature specimens) meeting to form a brownish gray throat band; upper surface of fore and hind feet gray, often approaching whitish on the hind feet; ears rather broad and low, brown, practically naked (short, grayish hairs are visible under a lens); tail rather indistinctly bicolor, blackish above, the lower surface (about one third of the circumference) dull flesh-color; the tail is scantily haired, the hairs partly (in some specimens wholly) concealing the annulations.

The young in first pelage are dusky gray above, the hairs faintly tipped with yellowish, darker along the middle of the back, grayer on the sides; below white, with sometimes a broad pectoral band of gray.

Measurements.—Type, total length, 425 mm.; tail vertebræ, 178; hind foot, 43, with claws, 50. Seventeen adult males and 18 adult females present the following measurements: 17 males, total length, 396 (372–440); tail vertebræ, 162 (155–185); hind foot (with claws), 50.5: 18 females, total length, 366 (352–408); tail vertebræ, 154 (134–175); hind foot, 47 (45–50).

Skull (of type), total length, 54; basal length, 38; zygomatic width, 25; mastoid width, 20.3; interorbital width, 12; length of nasals, 20; width of nasals at middle, 6; crown length of upper toothrow, 8; palatal length, 9; length of lower toothrow, 9.

This species is based on a series of 90 specimens, of which 45 are from Bonda, and the remainder about equally from Santa Marta, Mamatoca, and other nearby points, ranging in altitude

from sea level to 500 feet. As usual in doubtless all the species of *Echimys*, about one in four to six, in the adults, is tailless.

In coloration *Echimys canicollis* appears to greatly resemble *Loncheres caniceps* Günther (P. Z. S., 1876, 745), from Medellin, but here the resemblance ceases, the two forms being not even congeneric.

It is very different in color from either of the three other species mentioned in the present paper, and differs likewise in cranial characters. In dentition it is quite similar to *E. trinitatis*, *E. mincæ*, and *E. urichi*, but the skull is relatively shorter and broader, the audital bullæ are very much larger, and the pterygoids much slenderer and very differently shaped, while the basi-occipital region is greatly narrowed, in consequence of the unusual size of the audital bullæ. It seems not to need comparison with any of the other described species of the genus.

Heteromys jesupi, sp. nov.

Type, No. 15347, near Minca (at an alt. of 1000 ft.), Santa Marta District, Colombia, July 30, 1899 ; Coll. H. H. Smith.

Slightly larger than *Heteromys anomalus* of Trinidad, and much paler. General color above grayish brown slightly varied with yellowish ; beneath pure white, including the inner surface of the limbs, the white extending well up on the sides and running forward along edge of the cheek pouches to the nose, as in the allied forms, *H. anomalus*, *H. melanoleucus*, and *H. longicaudatus ;* upper surface of hind feet dull white ; of fore feet grayish white ; forearm grayish brown, instead of blackish brown, as in the other forms ; tail and ears scantily haired. Mammæ, $\frac{1}{1}+\frac{2}{2}=6$,—two pectoral and four inguinal. Soles naked, 6-tuberculate.

Measurements.—Type, total length, 330 mm. ; tail vertebræ, 163 ; hind foot, 33 ; ear (in skin), 16.3.

Skull, total length, 31.5 ; basal length, 26 ; zygomatic width, 16 ; mastoid width, 16 ; interorbital width, 8.6 ; crown length of upper toothrow, 4.5 ; length of lower toothrow, 4.6.

Named in honor of Morris K. Jesup, President of the American Museum of Natural History, through whose liberality the Museum has been placed in possession of the extensive collection of Colombian mammals which forms the basis of the present paper.

Heteromys jesupi is based on a series of 13 specimens, from six different localities in the Santa Marta District, varying in elevation from sea level to 2000 feet, as follows : Bonda and Mamatoca,

each 1; Bonda 3; Masinga Veija (500 feet), 3; Minca, (1000–2000 feet), 5. It is readily distinguishable from either *H. anomalus* or *H. melanoleucus* by its decidedly paler coloration, which is even more strongly shown by the young in first pelage than in the adults. The young of *H. jesupi* is grayish brown; of *H. anomalus* blackish brown. The similarity in size between the three South American species is shown in the following table of measurements. It should be noted that measurements of *H. jesupi* are all from females, and should be compared with those of the females of the other two species. From this comparison it is evident that *H. jesupi* is rather larger than either *H. anomalus* or *H. melanoleucus*.

	No. of Speci.	Sex.	Total Length.	Tail Vertebræ.	Hind Foot.
Heteromys anomalus	7	♂	290 (273–307)	160 (146–178)	35 (33–37)
" "	14	♀	277.5 (265–290)	151 (132–160)	34 (33–36)
" *melanoleucus*	11	♂	281 (276–309)	164 (151–180)	34.3 (33–36)
" "	15	♀	264 (246–287)	149 (136–167)	34 (30–35)
" *jesupi*	6	♀	292 (272–330)	160 (146–185)	34 (30–36)

NOTE ON *Heteromys melanoleucus* GRAY.—The small collection of mammals recently received from Mr. F. W. Urich, of Port-of-Spain, Trinidad, contained, among others of much interest, 31 specimens of *Heteromys melanoleucus* Gray (Proc. Zoöl. Soc. London, 1868, 204). Of these 23 were collected at Los Palmales, and the others at the nearby locality Quebrada Secca, in the mountains about 90 miles south of Cumana, at an altitude of about 3000 feet, in December, 1898.

Gray gave the habitat of his *H. melanoleucus* as "Honduras," but, as shown by Mr. E. R. Alston, incorrectly, the specimen on which it was based having been sent by Dyson from Venezuela.[1] The exact locality of the specimen is not known, but is presumably near the coast in northern Venezuela.

As shown by the measurements given above, the external dimensions agree very closely with those of *H. anomalus* from Trinidad. There is practically also no difference in color, but the well made skins give the impression of a much stouter animal. This is well substantiated by the skulls, which are very

[1] Ann. and Mag. Nat. Hist. (5) VI, 1880, 118; Biol. Centr.-Am., Mamm., 167.

much larger, there being an average difference of about 3 mm. in total length, and very nearly a full millimetre in mastoid breadth. This difference is shown somewhat by the external measurements, inasmuch as the maximum size is greater in both sexes in *H. melanoleucus* than in *H. anomalus.* The skull is also not only larger in its linear dimensions, but is much more heavily built. The two forms, though closely related, are thus readily separable.

Akodon venezuelensis, sp. nov.

Type, No, 14724, ♂ ad., Quebrada Secca, near Cumana, Venezuela. Collected Dec, 10, 1898, by Mr. F. W. Urich.

Color above yellowish brown with a slight olivaceous shade, varied with blackish, the hairs being plumbeous nearly their whole length, and tipped slightly with yellowish brown, producing a minutely grizzled effect, shading on olive; lower surface lighter, in general effect grayish washed with pale ochraceous, the color of the lower parts passing insensibly on the sides into the color of the upper surface; head concolor with the body; ears medium, dark brown, nearly naked on both surfaces; tail blackish above, grayish below, covered with very short hairs, through which the annulations are distinctly visible; feet dusky above, the soles of the hind feet black.

Measurements.—Type, total length, 161 mm.; tail vertebræ, 60; hind foot, 21.5, with claws, 24; ear, 16. The tail in this specimen is apparently abnormally short, due probably to injury in life, as in a series of five other specimens the tail ranges in length from 70 to 77 mm. A series of 6 specimens, 3 males and 3 females, all adult, measures as follows: Total length, 176 (166–189); tail vertebræ, 71 (60–77); hind foot (with claws), 22.3 (20–24); ear, 16 (15–17).

Skull, total length, 34.5; basal length, 23; zygomatic width, 19.6; mastoid width, 13; interorbital breadth, 6; length of nasals, 10; length of palatal foramina, 6.5; length of upper molar series, 5; length of lower jaw (condyle to tip of incisors), 20; height (coronoid to angle), 8.

Akodon venezuelensis is based on six specimens taken by Mr. F. W. Urich at Quebrada Secca, in the mountains 90 miles south of Cumana, Venezuela. They are all adult, and are very uniform in coloration and size. Compared with *A. urichi*, from Trinidad, it is smaller, with larger ears and a relatively longer tail, and is very strikingly different in coloration, the general color above being much paler and lacking the ruddy general effect seen in *A. urichi*.

Akodon columbianus, sp. nov.

Type, No. 15336, ♂ ad., Manzanares (alt. 3000 ft.), Santa Marta District, Colombia, Sept. 6, 1899; Coll. H. H. Smith.

Above dark brown minutely grizzled with strong yellowish brown, varied

with black, with a tendency to a blackish median dorsal area; below uniform rusty brown, the rusty tips of the hairs often quite concealing the grayish under color; ears blackish, nearly naked; tail dusky, unicolor, entirely naked, the scanty very short hairs in no degree concealing the annulations; feet dusky (hind feet blackish), thinly haired.

Measurements.—Type, total length, 230 mm.; tail vertebræ, 102; hind foot, 27, without claws, 24 5; ear (in dry skin), 14. Four adult specimens (3 males and 1 female) measure as follows: Total length, 222 (207–230); tail vertebræ, 97 (94–102); hind foot, 26.5 (25–27).

Skull, total length, 30; basal length, 23; zygomatic width, 16; mastoid width, 13; interorbital width, 6.5; length of nasals, 7; length of palatal foramina, 4.6; length of upper toothrow, 4.8; length of lower jaw (condyle to tip of incisors), 17.5, height of lower jaw (coronoid to angle), 7.5.

Akodon columbianus differs from its nearest geographical ally, *A. venezuelensis*, by its much darker color, and very long, wholly naked tail, and by the unusual shortness of the rostral portion of the skull, and the corresponding shortness of the palatal foramina, which also terminate posteriorly considerably in advance of the first molar. While apparently as dark in color as *A. bogotensis*, it differs from that species in its larger size, very long tail, and in important cranial characters, the proportions of the skull being quite different, with the usual resulting differences in details.

This species is based on 4 specimens, 3 of which were taken at Manzanares (altitude 3000 feet), September 6, 1899, and the other at Minca (altitude 2000 feet), July 17, 1899. They are all adult, and very uniform in coloration.

Oryzomys maculiventer, sp. nov.

Type, No. 15306, ♂ ad., Sierra El Libano (alt. 6000 ft.), Santa Marta District, Colombia, May 17, 1899; Coll. H. H. Smith.

Pelage full, long, and soft. Color above tawny rufous varied with black-tipped hairs, brighter and clearer tawny on the sides; top of head darker and less tawny than the back, nose and sides of face to the eyes gray; beneath pure white, in adults the hairs are clear white to the base all over the ventral surface, which is sharply defined against the sides; forearm and manus pure white to above the elbow; hind limbs externally like the sides of the body, less rufous on the inner face; hind feet gray with a tinge of fulvous, especially proximally; ears rather large, brown, nearly naked on both surfaces except on the anterior base externally; tail naked, bicolor, brown above, flesh-color below.

Measurements.—Type, total length, 335 mm.; tail, 170; hind foot, 32 (without claws, 29); ear (in dry skin), 19. Twenty-eight adults, 18 males and 10

females, measure as follows: Males, total length, 329 (307–345); tail, 176 (162–194); hind foot, 32.7 (29–36). Females, total length, 312 (302–333); tail, 172 (163–182); hind foot, 32 (28–34).

Skull, type, total length, 34.4; basal length, 27; zygomatic width, 18; mastoid width, 13; interorbital width, 5; length of nasals, 7.6; palatal length, 7.8; length of palatine foramina, 5.5; length of upper toothrow, 5.5; length of lower jaw (condyle to incisor tips), 20; height (condyle to angle), 8.5; at coronoid process, 8.5.

Young in first pelage.—Above dark, many of the hairs rufous tipped; sides of the nose paler and more tinged with rufous; below dark gray, with irregular patches of white, the general color of the ventral surface passing gradually on the sides into that of the upper surface; ears, tail, and feet nearly as in the adult, except that the fore limbs are externally like the sides of the body. The ventral patches of white are variable in size and consist usually of a small anal patch and a very large pectoral patch, in which the hairs are white to the base, as in the adults.

From this early phase there is every gradation to the pelage of the adult. This change is most noteworthy and interesting in respect to the ventral surface, where the original white patches gradually extend till the whole ventral area becomes entirely pure white to the base of the hairs. Not only do the original white patches increase in extent, but white hairs also become intermixed with the gray of the general surface, so that the original gray becomes veiled with white long before the gray disappears from the basal portion of the pelage. In advanced stages of the change the pectoral patch extends forward to the throat, and backward along the median line of the belly, meeting the enlarging anal patch, at this stage only the lateral portions of the ventral surface remaining gray, more or less strongly veiled with white. The wholly pure white ventral surface seems to be acquired slowly, and may never be obtained by all individuals, as the percentage of such specimens is small in the present large series, being not over one in seven. The particolored condition of the majority of even the practically adult specimens has suggested the specific name here imposed.

Oryzomys maculiventer seems to be a common species in the Sierra El Libano district, the present series numbering 47 specimens, collected as follows: Valparaiso, altitude 4500 feet, 13 specimens, April 14–June 16, 1899; Sierra El Libano, elevation 6000 feet, 34 specimens, May, 1899.

This is one of the largest members of the genus known to me, being considerably larger than any species thus far described from northeastern South America. In cranial characters it resembles *O. meridensis* Thomas, from Merida, Venezuela, and it seems also related to *O. albigularis* (Tomes), from Pallatanga, Ecuador, but is much larger than either, and apparently differs

in coloration. A peculiar feature of the skull is the shortness of the palatine foramina.

Oryzomys trichurus, sp. nov.

Type, No. 15328, ♂ ad., El Libano plantation, near Bonda (alt. 500 ft.), Santa Marta District, June 29, 1899; Coll. H. H. Smith.

Pelage ordinary. Color above strong yellowish brown, approaching ochraceous, conspicuously lined with black; sides, and especially the sides of the face, ochraceous; below uniform pure white to the base of the fur; ears rather small, brown, well covered externally with short yellowish brown hairs; tail considerably longer than head and body, heavily clothed with pale yellowish brown bristly hairs, completely concealing the annulations; fore feet whitish, hind feet yellowish buff.

Young in first pelage are yellowish gray-brown above, rather clearer fulvous on the cheeks and sides, and pure white below to the roots of the hairs, as in the adult. Tail hairy.

Measurements.—Type, total length, 281 mm.; tail vertebræ, 160; hind foot, 23, with claws, 25; ear (in dry skin), 13.

Skull, total length, 30; basal length, 22; zygomatic width, 15; mastoid width, 11; interorbital width, 5; length of nasals, 10.5; palatal length, 5.3; palatine foramina, 5; upper toothrow, 4; lower jaw, length (condyle to incisor tips), 18; height (condyle to angle), 6.7; height at coronoid, 6.5.

Oryzomys trichurus is based on an adult male and two young (as skins, other young in alcohol), all from near Bonda. An adult nursing female, also from Bonda, resembles the type in measurements and coloration, and is indistinguishable also in cranial characters, but has the tail nearly naked, possibly from the wearing off of the hair.

This species is at once recognizable by its heavily clothed tail, pure white underparts, and strong fulvous coloration above. It evidently belongs to the *O. flavicans* group, from which it differs in its heavily clothed tail and pure white underparts. The tail is as hairy as in *Rhipodomys sumichrasti*. *O. flavicans illectus* Bangs, from Pueblo Viejo, Colombia, from an altitude of 8000 feet (*O. trichurus* is from near sea level), is similar in most respects, but has the underparts "a beautiful rich orange-buff to base of hairs." A specimen in the Smith collection from Minca, altitude 2000 feet, is apparently intermediate between *illectus* and *trichurus*, it having larger ears than *trichurus*, and being much deeper colored above, with an orange ochraceous lateral band, the lower parts strongly tinged with ochraceous, and the tail naked. This

specimen I refer provisionally to *O. f. illectus*, though evidently it is not typical.

In notes on the labels the collector states that in one case the young specimens were found in a nest in a hollow tree, and in the other in a bird's nest.

Oryzomys sanctæmartæ, sp. nov.

Type, No. 15312, ♀ ad., Bonda, Santa Marta District, Colombia, June 5, 1899; Coll. H. H. Smith.

Pelage full, long, and rather coarse. Color above pale yellowish brown, lined with black, through the admixture of many black-tipped hairs; sides, including cheeks, paler and grayer; ventral surface entirely clear whitish gray, the fur plumbeous at base; ears rather small, pale brown, nearly naked; tail short, indistinctly bicolor, blackish brown above, a little lighter (in some specimens fulvous gray) below, nearly naked, except apically, where the short hairs are more numerous and longer; feet grayish flesh-color; hind feet stout and broad, the lateral toes relatively rather shorter than usual in species of *Oryzomys*.

Measurements.—Type, total length, 229 mm.; tail vertebræ, 100; hind foot, 24.5 (with claws, 27); ear (in dry skin), 15.

Skull, total length, 31; basal length, 24; zygomatic width, 16; mastoid width, 12; interorbital width, 5; length of nasals, 13; palatal length, 5.2; length of palatine foramina, 6.2; length of upper toothrow, 4.4; length of lower jaw (condyle to incisor tips), 20; height at condyle, 7; height at coronoid, 8.

Oryzomys sanctæmartæ is based on 8 fully adult specimens—5 males and 3 females—collected in the low coast district (sea level to 500 feet) near Santa Marta (Santa Marta, 1 specimen; Bonda, 4; Mamatoca, 2; Masinga Veija, 1), April 15 to June 12, 1899. They are very uniform in coloration; a single 'young adult' female differs from the others in being somewhat darker above.

This form belongs to the same short-tailed group of the genus as *O. brevicauda* Allen & Chapman, from Trinidad, and *O. phæopus* and *O. phæopus obscurior* Thomas, respectively from Pallatanga, Ecuador, and Concordia, Medellin, Colombia, all these localities being in very different faunal areas from that about Santa Marta. It is, however, much smaller than *O. brevicauda*, and very different in coloration, the pale yellowish-brown of the upper parts of *O. sanctæmartæ* contrasting strongly with the rufous brown of *O. brevicauda*. On the other hand, *O. sanctæmartæ* is evidently

very much paler than *O. phæopus*, which is described as nearly agreeing in the color of the upper parts with the "vandyke-brown" of Ridgway's 'Nomenclature of Colors,' and as "dirty-buff" below; while *O. sanctæmartæ* agrees, above, quite nearly with Ridgway's "tawny-olive," and is clear light-gray below. It is also rather larger than *O. phæopus*, while *O. phæopus obscurior* is described as still smaller and darker than *O. phæopus*. The following table shows the comparative measurements of these four forms.

	No. of Spec. and Sex.	Total Length.	Tail Vertebræ.	Hind Foot.
O. sanctæmartæ	5 ♂	230 (216–241)	97.6 (90–103)	26.5 (25–29)
" "	3 ♀	220 (210–235)	92 (85–100)	25.7 (23–27)
O. brevicauda	13 ♂	253 (230–272)	103 (83–115)	28 (26–30)
" "	5 ♀	233 (220–238)	89 (88– 93)	27 (25–30)
O. phæopus	1	210	98	24 (without claw)
O. p. obscurior	1	200?	89? (tail defective)	22.4 (without claw)

Oryzomys mollipilosus, sp. nov.

Type, No. 15323, ♀ ad., Valparaiso (alt. 4500 ft.), Santa Marta District, May 10, 1899; Coll. H. H. Smith, "Mother of four young"—collector's note on label.

Pelage soft and velvety, especially soft and downy on the ventral surface. Color above, yellowish gray-brown, strongly varied with black-tipped hairs, tending to a blackish median dorsal area; sides paler, gray-brown faintly tinged with pale buff; below clear uniform ashy gray, the basal half of the hairs pale plumbeous; ears medium, blackish brown, almost naked; tail dark brown above, a little paler below, very finely scaled and nearly naked; feet flesh color.

The young in first pelage are blackish brown, the hairs, more especially on the sides, slightly tipped with pale yellowish-brown; lower parts as in adult.

Measurements.—Type, total length, 233 mm.; tail, 110; hind foot, 25.5, with claw, 28; ear (in dry skin), 14. A series of 3 adults measures as follows: Total length, 330 (225–333); tail, 110 (108–113); hind foot, 29 (27–30).

Skull, total length, 30; basal length, 21.5; zygomatic width, 14; mastoid width, 12; interorbital width, 5; length of nasals, 10; palatal length, 6; length of palatal foramina, 3.8; length of upper toothrow, 4.3; length of lower jaw, 18; height at condyle, 7; height at coronoid, 6.5; length of lower toothrow, 4.5. Supraorbital bead well developed.

Oryzomys mollipilosus is based on four adults and three young,

all from Valparaiso (altitude 4500 feet), except one, which is from Minca (altitude 2000 feet). The adults vary a little in the amount of black intermixture in the dorsal area, the Minca specimen, referred here doubtfully, having quite a distinct median blackish area.

This species appears to be related to *O. gracilis* Thomas, from Concordia, Medellin, Colombia, resembling it in proportions, in its soft velvety pelage, and in the general coloration of the upper parts. It is, however, not white on the under surface, and is very much larger. It also greatly resembles *O. magdalenæ* of the present paper, but is much paler above, and also very much larger. That the specimens of *O. mollipilosus* are adult is evinced by the fact that two of the females were nursing young.

Oryzomys magdalenæ, sp. nov.

Type, No. 15318, ♀ ad., Minca (alt. 2000 ft.), Santa Marta District of Magdalena Province, Colombia, August 3, 1899; Coll. H. H. Smith.

Pelage, short, very soft, and velvety. Above strong yellowish brown, much varied with black, especially along the median area, paler, uniform yellowish brown on the sides; below uniform whitish gray, the hairs plumbeous at base, and the pelage very thick, short, and velvety; ears blackish brown, of medium size, naked; tail brown, scarcely lighter below, naked, very finely scaled; feet flesh color.

Measurements.—Type, total length, 244 mm.; tail, 144; hind foot, 33; ear (in dry skin), 15. Another specimen, ♂ ad., from Valparaiso, measures as follows: Total length, 234; tail, 135; hind foot, 29, with claws, 32.

Skull, total length, 31.5; basal length, 25; zygomatic width, 15; mastoid width, 12.2; interorbital width, 5.3; length of nasals, 12; palatal length, 7; length of palatal foramina, 3.4; length of upper toothrow, 4.3; length of lower jaw, 19.2; height at condyle, 7; height at coronoid, 7; length of lower toothrow, 4.8.

Oryzomys magdalenæ is based on two specimens, one of which, a female, is from Minca and the other, a male, from Valparaiso.

This species belongs to the same group as *Oryzomys gracilis* Thomas, and *O. mollipilosus* of the present paper, and perhaps *O. velutinus* Allen & Chapman from Trinidad. The latter, however, is larger and much redder, and has much larger ears. *O. mollipilosus* is, as regards general features, a miniature of *O. magdalenæ*, but is paler, as well as much smaller, and has a relatively much shorter tail.

Oryzomys villosus, sp. nov.

Type, No. 15321, ♀ ad., Valparaiso (alt. 4500 ft.), Santa Marta District, Colombia, April 15, 1899; Coll. H. H. Smith.

Pelage soft, fine, and velvety throughout. Color above yellowish brown, mixed with black, paler and more yellowish on the sides; below uniform whitish gray, fur plumbeous at base; ears light brown, large, naked; tail long, brown, a little lighter below than above, more especially on the proximal half; feet buffy gray.

Measurements.—Type, and only specimen: total length, 275 mm.; tail, 148; hind foot, 26, with claws, 28.5; ear (in dry skin), 17.

Skull, total length, 32.6; basal length, 26; zygomatic width, 17.5; mastoid width, 12.4; interorbital width, 5.5; length of nasals, 11; palatal length, 7; length of palatal foramina, 5; length of upper toothrow, 5.4; length of lower jaw (condyle to incisor tips), 21; height, condyle to angle, 8.3; height at coronoid, 8; length of lower toothrow, 6. Skull short, broad, especially the rostral portion; coronoid low, broad, angular, without the usual prominent backwardly directed point.

Oryzomys villosus is based on a single adult nursing female, from Valparaiso. Apparently only four mammæ were functionally developed, of which one pair is inguinal and one pair axillar. This is a long-tailed, rather large species, with rather large ears and a remarkably soft, short, velvety pelage throughout. (The pelage, however, seems rather worn.) The skull is short, broad, and massive, with the coronoid very low and broad, forming merely an obtuse angle without a sharp point; yet the two sides are alike and the structure seems normal. It is apparently nearly related to *O. meridensis* Thomas, but is smaller, with a relatively longer tail, very much smaller ears, and a quite different coloration. It is perhaps still nearer *O. vestitus* Thomas, also from Merida, from which its smaller size and dissimilar coloration should distinguish it.

Oryzomys palmarius, sp. nov.

Type, No. 14733, ♂ ad., Quebrada Secca, Venezuela, Dec. 10, 1898; F. W. Urich.

Pelage full, long, and soft. Color above yellowish gray-brown, varied with blackish-tipped hairs, passing into pale fawn on the sides; head and face much grayer than the body; below dull grayish white, the plumbeous underfur well concealed by the whitish tips; ears of medium size, brown, thinly-haired; forearm and manus dingy gray, the toes lighter, whitish; hind foot short for the size of the animal, thinly haired, varying in different specimens from dingy

gray to flesh color; tail long, dark brown, nearly unicolor, naked except towards the tip, where it is scantily clothed but not penicillate.

Measurements.—Type, total length, 269 mm.; head and body, 119; tail vertebræ, 150; hind foot, 21.5, with claws, 24; ear, 19. Four adults measure as follows: Total length, 260 (238–281); tail vertebræ, 146 (135–162); hind foot, 25 (24–26); ear, 17 (16–19).

Skull (of type), total length, 31; basal length, 24; zygomatic width, 16.6; mastoid width, 12.4; interorbital width, 5.3; nasals, 11; palatal length, 7.2; palatal foramina, 6.5; upper toothrow, 5; lower jaw, length (condyle to incisor tips), 20; height, angle to condyle, 7.8.

Oryzomys palmarius is based on five adult specimens, four of which are from Quebrada Secca, and one from Los Palmales, taken Nov. 26 to Dec. 10, 1898, by Mr. F. W. Urich. One, a young adult, differs a little from the others in being darker and less fulvous.

This species is a very near ally of *Oryzomys trinitatis* Allen & Chapman, from Trinidad. It differs from it in being decidedly smaller and paler, and in having a grayer head and face. In proportions, in the texture of the pelage, and in cranial characters (except in the much smaller size of the skull), there is a close similarity. The tail, however, is slightly villous, especially toward the tip, and not naked, as in *O. trinitatis*. It is very much smaller and otherwise very different from either *O. meridensis* Thomas, or *O. vestitus* Thomas, both from the vicinity of Merida.

Oryzomys tenuicauda, sp. nov.

Type, No. 14737, ♂ ad., Los Palmales, Venezuela, Dec. 5, 1898; F. W. Urich.

Pelage long and soft. Ears of medium size. Color above dark fawn brown, shaded on the back with dusky, and passing into bright fulvous on the sides; below clear white, basal half of fur plumbeous; ears brown, slightly hairy; tail dark brown, unicolor, basal third nearly naked, middle portion well haired, the hairs increasing in length and thickness on the apical half, hiding the scales, and at the tip forming a thick pencil 10 mm. long; fore feet buff; hind feet short, the edges and toes buff, with a dusky median band to the base of the toes.

Measurements.—Type, total length, 216 mm.; head and body, 88; tail vertebræ, 128; hind foot, 20.5, with nails, 23; ear, 19.

Skull, total length, 27; basal length, 20.5; zygomatic width, 15; mastoid width, 11; interorbital width, 5; length of nasals, 8; palatal length, 4;

palatine foramina, 4.3; upper toothrow, 4.3; lower jaw, length (condyle to incisor tips), 17.5; height, angle to condyle, 7.

This species is based on a single specimen, an adult male, from Los Palmales, Venezuela, but I refer to it provisionally, also, a young adult from Quebrada Secca.

In the texture of the pelage and in color *O. tenuicauda* is a miniature of *O. velutinus* from Trinidad; it is, however, somewhat paler, and the tail is proportionately fully one third longer, and hairy in the apical half instead of entirely naked; the hind foot is also relatively very much shorter. It seems to possess no very near ally among the described species of northeastern South America. The skull presents nothing peculiar.

Oryzomys modestus, sp. nov.

Type, No. 14734, ♀ ad., Campo Alegre (alt. about 3000 ft.), Venezuela; F. W. Urich.

Pelage very soft and close, of moderate length. Above dark rufous brown, darkened with an abundance of black-tipped hairs; sides clearer deep rufous; below gray, the hairs whitish-tipped, plumbeous at base, which tint enters into the surface color; forearms gray, feet flesh color; hind feet flesh color, thinly-haired; ears large, dark brown, covered with very short dark brown hairs; tail blackish brown, unicolor, nearly naked, one fifth shorter than head and body.

Measurements.—Type, total length, 220 mm.; head and body, 120; tail, 100; hind foot, 25, with claws, 28; ear, 20.

Skull, type (imperfect at base), total length,—; basal length,—; zygomatic width, 16; interorbital width, 5; length of nasals, 12; palatal length, 7; palatal foramina, 5; upper toothrow, 4.5; lower jaw, condyle to incisor tips, 19; angle to condyle, 7; lower toothrow, 5. The skull presents the usual characters of the genus.

Oryzomys modestus is based on a single adult female from Campo Alegre, near Quebrada Secca, Venezuela. It appears to be very distinct from any previously described species. It differs from *O. tenuicauda* in its much larger ears, very much darker coloration, and very short tail, the tail being much shorter than the head and body instead of one third longer, as in *O. tenuicauda.*

Oryzomys fulviventer, sp. nov.

Type, No. 14735, ♀ ad., Quebrada Secca, Venezuela, Nov. 23, 1898; F. W. Urich.

Pelage full, soft, and long. Color above dark fulvous brown, finely grizzled with black-tipped hairs; nose and frontal region darker than back, grayish fulvous strongly mixed with black; below strongly washed with fulvous, the pelage basally plumbeous; chin and throat whitish, the hairs white to the base; upper surface of feet dingy gray; ears medium, thinly haired, many of the hairs slightly tipped with fulvous; tail blackish, unicolor, nearly naked except apically, where it is thinly clothed and slightly penicillate.

Measurements.—Type, total length, 270 mm.; head and body, 131; tail vertebræ, 139; hind foot, 25, with claws, 27; ear, 19.

Skull, total length, 32; basal length, 25; zygomatic width, 17; mastoid width, 12.3; interorbital width, 5.1; length of nasals, 11; palate, 6; palatal foramina, 5.7; upper toothrow, 5; lower jaw, condyle to incisor tips, 20.3; angle to condyle, 9; lower toothrow, 5.6. Supraorbital bead strongly developed.

Oryzomys fulviventer is based on a single adult female, from Quebrada Secca, Venezuela (altitude about 3000 feet). Its fulvous underparts, combined with its size and proportions, distinguish it from any other species described from either Venezuela or Colombia. It is certainly not *O. flavicans* Thomas, from Merida. What its relations may be to forms from Guiana and Brazil I am unable to say, but, on the basis of geographical considerations, it is not likely to prove identical with any species from these faunally very different regions.

Sciurus saltuensis bondæ, subsp. nov.

Sciurus variabilis BANGS, Proc. Biol. Soc. Washington, XI, 1898, 184. (Not of I. Geoffroy.)

Type, No. 15234, ♀ ad., Bonda, Santa Marta District, Colombia, July 4, 1899; Coll. H. H. Smith.

Winter or Breeding Pelage.—General color (in the type) of the upper parts, limbs externally, and the tail, deep red; ventral surface, including the inner side of the fore limbs nearly to the wrist and of the hind limbs nearly to the ankle, pure white; sides of the head below the eyes, mouth parts, and throat, fulvous; top of the head, superficially red like the back, but with most of the hairs subapically annulated with black, giving a slight dingy cast in contrast with the body; also the hairs of the lower back and base of the tail are annulated below the surface with black; tail hairs entirely deep red from base to tip, without trace of black annulations. In other specimens the tail hairs are narrowly, or in some cases broadly, banded with black.

Summer or Post-breeding Pelage.—General color above yellowish red varied with black, resulting in a general olivaceous effect, the hairs individually being annulated near the tips with yellowish red and black; ventral surface and the tail as in the winter pelage. The fore limbs, a narrow lateral line, the inner

edge of the thighs, and the hind feet usually clear yellowish red, but frequently the front surface of the forearm and the proximal half of the hind feet show annulated hairs.

Young.—Young specimens in first pelage are usually yellowish red to dark red (the tail varying greatly in different specimens), the hairs individually annulated more or less strongly with black, thus resembling in a general way the post-breeding pelage of the adults.

Measurements.—Type, total length, 474 mm. ; tail vertebræ, 230 ; hind foot, without claws, 50, with claws, 55. Adult breeding males and females from Bonda measure as follows : 13 males, total length, 472 (439–520) ; tail vertebræ, 227 (205–255) : 16 females, total length, 477 (448–500) ; tail vertebræ, 223 (215–250).

Skull.—Premolars, $\frac{1}{1}$. Total length, 56 ; basal length, 42 ; zygomatic width, 31 ; postorbital width, 19 ; upper toothrow, 9,2 ; lower jaw (condyle to incisor tips), 32 ; height, angle to condyle, 20.

This variable species is represented by a series of 54 specimens, of which 50 were collected at Bonda (near sea level) and 4 at Minca (alt. 2000 ft.). The Minca specimens were taken July 24 to August 1 ; 36 of the Bonda specimens were taken in July, 5 in June, 4 in August (Aug. 2 and 3), 1 in each of the months May, April, and March, and 2 in November. The material is therefore insufficient to show satisfactorily the variations of color and character of pelage incident to season. The very large series of July specimens, however, shows various conditions of pelage, and indicates that a large part of the color variation is due to change of pelage by molt, while there is also evidently a wide range of individual variation.

In general terms, the July specimens vary from nearly uniform bright red (the pure white ventral surface of course always excepted) to a nearly uniform olivaceous effect (the limbs excepted, which are always red), due to a minute mixture of yellowish red and black, the individual hairs of the upper surface being yellowish red or red (the shade varying in different specimens from light to dark red), broadly annulated near the tip with black. Between these extremes there is every intermediate stage. A very common intermediate stage has a narrow band of red bordering the white of the ventral surface, which broadens upward at the shoulders, and often meets on the back.

On comparing the two extremes a marked difference in the character of the pelage in the two phases is strikingly evident. In the wholly red phase the coat is longer than in the olivaceous

phase, and the individual hairs of the dorsal region are lustrous red, entirely lacking the black annulations. In the next stage the long red hairs form a broad mantle, covering the shoulders and extending along the sides, while the head and back are mixed red and black, the hairs over these portions being shorter and conspicuously annulated with black. In the extreme olivaceous phase the pelage is much shorter, and the whole dorsal surface is covered with annulated red and black hairs, while the feet, the forearms, outer edge of the thighs, and a narrow line bordering the white of the ventral surface are red. About ten of the specimens are distinctly in the clear red phase, and about the same number are in the annulated olivaceous phase, the remaining one half to two thirds being in various stages of transition between the two. In all of these the color of the dorsal surface extends for a short distance on to the base of the tail ; in the wholly red specimens the basal portion of the tail is red, like the back.

The individual variation consists mainly in intensity of the red of the general pelage, this varying from light yellowish red to dark or chestnut red. The tail is exceedingly variable in respect to the amount of black near the base of the hairs. The greater part of the specimens, irrespective of variations in the color of the body, have all the tail hairs entirely red to the base ; in others a portion of the hairs are broadly annulated with black near the base, the number of these hairs and the width of the black band increasing from the base of the tail toward the tip. This development of black in the tail varies, in specimens where black is present, from a faint trace, most pronounced on the outer third of the tail, to a conspicuous broad band, visible at the surface without parting the hairs, or at least producing a clouded effect near the tip. As thus developed the black forms a broad concealed subbasal zone, occupying from one fifth to one third the length of the hairs, which are red at base and tip, the overlying hairs on both surfaces of the tail being intense deep red.

Individual variation in color is also well shown in a series of 6 one-fourth to one-third grown young. One of these was taken in June, four in July (July 7–14), and one Nov. 18. The June and July specimens resemble the red phase of the adults, while the November specimen resembles the mixed red and black phase.

The extent of white upon the inner surface of the limbs varies greatly, particularly on the hind limbs, where it is sometimes almost absent and sometimes extends nearly to the ankle.

The seasonal and also the individual variation is closely parallel to that of the *Sciurus hudsonicus* group of North America. The present series shows unmistakably two distinct pelages, but the seasonal change in color due to molt must extend over a considerable period. The June and July specimens present nearly every state of change. Also, as in *Sciurus hudsonicus*, not all of the specimens acquire the full red stage on completion of the post-breeding pelage, this condition, as in *S. hudsonicus*, being probably more or less influenced by the age of the individual.

The type locality of *Sciurus variabilis* has been currently considered to be Colombia, from Geoffroy's statement,[1] that the species was based on "trois individus envoyés au Muséum d'histoire naturelle par M. Plée, et sur lesquels je ne puis donner aucun renseignement, si ce n'est qu'ils venaient d'Amérique"; and further, that "plusieurs de ces objets [sent by M. Plée] appartenaient à la Colombie, plusieurs aux Antilles et quelques-uns aux Etats-Unis." Obviously the squirrels sent by M. Plée, forming the basis of *S. variabilis* Geoffroy, could not have come from either the Antilles or the United States. On the other hand, neither his description nor his figure agrees very well with any of the Colombian specimens in the present large series. He says, 'le pelage est en dessus d'un noir tiqueté de roûx ou d'un roux tiqueté de noir. La même remarque est applicable aux longs poils de la queue toujours noir à leur origine et roux à leur extrémité. Mais il résulte de la disposition distique de la queue qu'elle est toujours beaucoup plus noire à la face postérieure qu'à l'antérieure." The colored plate indicates the median area of the upper parts to be very dark from the nose to a little behind the middle of the back where the color changes abruptly to deep red over the posterior third of the dorsal region. The tail is represented as blackish for two thirds of its length from the base, the rest reddish, becoming yellowish at the tip. While the color of the anterior two thirds of the dorsal surface might agree well enough with specimens in the mixed red and black phase, the

[1] Guérin's Magasin de Zoologie, II, 1832, Classe I, pl. iv and accompanying (unpaged) text.

color of the posterior third of the back and the tail are wholly unlike any specimen in my series of upwards of fifty examples.

The description and figure, on the other hand, agree much better with the dark mountain form recently named *Sciurus variabilis saltuensis* by Mr. Bangs, especially in the dark upper parts and in the darkness of the basal portion of the tail, but the red lower back and rump are still discordant; and it is not probable, though possible, that M. Plée's specimens came from so far in the interior. They are much more likely to have come from western Colombia than from the coast district about Santa Marta.

Sciurus (Guerlinguetus) æstuans quebradensis, subsp. nov.

Type, No. 14725, ♀ ad., Quebrada Secca, Venezuela, Dec. 2, 1898; F. W. Urich.

Color above finely punctated pale yellow and black, giving a pale olivaceous gray general effect, nearly uniform throughout the whole dorsal aspect, including the basal portion of the tail and the limbs externally; cheeks and nose grayer; eye-ring and upper surface of feet more strongly yellowish; ventral surface orange-buff, the inside of the limbs paler, and the chin and throat still paler, or buffy gray; ears externally like the back, but with the hair tips a little more rufous; tail above grizzled with black and pale fulvous, broadly edged for the terminal two thirds with deep orange, in some specimens deep reddish orange; below similar but rather paler; the tail pattern below consists of three narrow bands of black, two of fulvous and an outer broad band of red as follows: a narrow basal band of black, followed by a narrow band of pale fulvous, a second narrow band of black, a second narrow band of rather deeper fulvous, a third broader band of black, and a very broad edging of orange rufous.

Measurements.—Type, head and body, 192 mm.; tail vertebræ, 156; total length, 348; hind foot, 46, with claws, 51; ear, 22. Three specimens, including the type, measure as follows: Total length, 345; tail vertebræ, 160; hind foot, 44.5, with claws, 50; ear, 22.

Skull, total length, 47; basal length, 35.5; zygomatic width, 27; mastoid width, 20; postorbital width, 18; length of nasals, 15; width of nasals at base, 5, in front, 6.

Sciurus æstuans quebradensis is based on three adult specimens, —two males and one female,—two of which are from Quebrada Secca, and the other from Los Palmales. They differ in color only in the tail, the outer red border of which is somewhat lighter in one specimen than in the others.

This form differs from *S. æstuans* (type locality, Surinam) in having all the tints very much stronger throughout. It differs also from its nearest geographical ally, *S. chapmani* from Trinidad, in being much lighter colored and less ruddy throughout, and consequently still more from *S. hoffmanni*.

Article XVII. — REPORT ON BIRDS RECEIVED THROUGH THE PEARY EXPEDITIONS TO GREENLAND.

By Frank M. Chapman.

From the Peary Expeditions to Greenland the Museum has received, through Mr. Morris K. Jesup, nearly 500 specimens of birds, contained in the following named collections :

1. Peary Collection ; 82 specimens, collected at various localities by Lieutenant Peary and his associates.

2. Dyche Collection ; 244 specimens, collected by Prof. L. L. Dyche, who accompanied the Peary Expedition of 1895 as the Museum's representative, largely at Holsteinborg from June 9 to July 20. This collection includes 29 specimens of the rarer Greenland birds purchased from the natives and the Danish Governors, Müller and Kock.

3. Figgins Collection ; 162 specimens, collected by Mr. J. D. Figgins, naturalist of the Peary Expedition of 1896. Mr. Figgins's field notes are given in the present paper, followed by his initials.

While these collections do not contain birds new to science, they include several particularly interesting series of young birds, notably of *Uria* and *Rissa*, and of adults—especially of *Somateria* and *Falco*—which add materially to our knowledge of the plumage changes or relationships of these species.

1. Colymbus holbœlli. Holbœll's Grebe.—One immature specimen without data.

["The only specimens of this species seen were two skins procured from natives. It is undoubtedly rare, as the natives make no attempt to preserve any but the rarer species."—J. D. F.]

2. Gavia lumme. Red-throated Loon. — Three adult specimens ; a female from Holsteinborg, July 6 ; a male from the north side of White Strait, July 27, and a specimen without data.

["A pair of these Loons is to be found on almost every large fresh-water pond near the coast. They are very inquisitive and

are easily decoyed by waving a bright-colored cloth. The nest is placed in the grass on some projecting point or small island; the grass being so short that the nest is in full view."—J. D. F.]

3. Fratercula arctica. PUFFIN.—One specimen from Holsteinborg, and one without data.

["At all the large breeding-places visited, the Puffin, Brünnich's Murre, and the Kittiwake were found in company, but each occupied its own, well-defined section of the cliff. The Kittiwakes usually occupy a deep recess of the cliff near the water; the Brünnich's Murres, all of the other section to a height of about 300 feet; above that, the Puffins are found. As the nests were in inaccessible locations, I could learn nothing of their breeding habits."—J. D. F.]

4. Fratercula arctica glacialis. LARGE-BILLED PUFFIN.—One specimen from Mauson Island.

5. Cepphus grylle. BLACK GUILLEMOT.—Thirty-six of the 37 Guillemots from Holsteinborg are referable to this species, the remaining one being typical *mandti*. Among these 36 birds there is considerable variation in the size of the bill, and in several examples it is fully as small as in *mandti*. *C. grylle* is also represented by two specimens from Disko Harbor, July 28.

6. Cepphus mandti. MANDT'S GUILLEMOT.—One male example from Holsteinborg, June 19; three from White Strait, July 26, and one from Hudson Strait, July 25.

["At all the places visited in North Greenland these birds were observed. They are usually found in small flocks of ten to twenty. The nest is a mere depression in the gravel, well back in crevices of the rock near the water. They are very curious and will swim round and round the ship while at anchor, each time approaching a little nearer. When disturbed, they duck their heads a few times and quickly dive, to appear again beyond range of shot-gun. Among the sailors, they are known as Sea-Pigeons."—J. D. F.]

7. Uria lomvia. BRÜNNICH'S MURRE.—Seven adults, collected by Professor Dyche at Holsteinborg, July 5, show some

variation in the development of the basal portion of the upper mandible, and all are darker in color than a single specimen from Iceland.

A series of 26 young birds, collected by Mr. Figgins at Parker Snow Bay, August 10 and 11, presents marked variation in color, and also affords material for a study of the growth of plumage in this species.

Newly hatched birds, apparently not more than a day or two old, vary in the color of the back from uniform pale cinnamon-brown to uniform glossy black, but the prevailing color of this region is black tipped with cinnamon-brown. The crown and hind neck are mixed black and white or black and brown, while the side of the head shows an intricate pattern of black and buff in which there is much variation. The abdominal region is usually white, but in some specimens is obscured with dusky.

The series does not show the complete development of plumage, but includes material which warrants some treatment of this subject.

A drawing of the feather tracts is presented as a map on which may be traced the development of plumage, the numbers there given corresponding to the numbers of the various stages now described. (See Figs. 1 and 2.)

Downy stage, newly hatched chick.—Completely covered with down with the exception of a small bare space on either side of the base of the neck.

Stage 1.—The first indication of the plumage succeeding the natal down is to be seen in the *pteryla alaris* where the primaries and secondaries emerge simultaneously; at the same time new feathers are appearing in the *pteryla humeralis*, those in the posterior half of this tract being slightly more advanced than those in the anterior half.

Stage 2.—Feathers now appear through the *pteryla ventralis*, the pectoral portion of this tract being somewhat more developed than its extremities, and the exterior lateral margins being somewhat more advanced than their inner borders. The greater wing-coverts now appear.

Stage 3.—Barely have white feathers started in the *pteryla ventralis*, when black feathers may be observed in the *pteryla dorsalis*, those in the posterior third of the anterior half being

slightly in the lead. The median and minor secondary coverts are now observable and the *pterylæ crurales* show new feather growth.

Stage 4.—The *pterylæ* in which feathers have already appeared show marked development before new growth appears through-

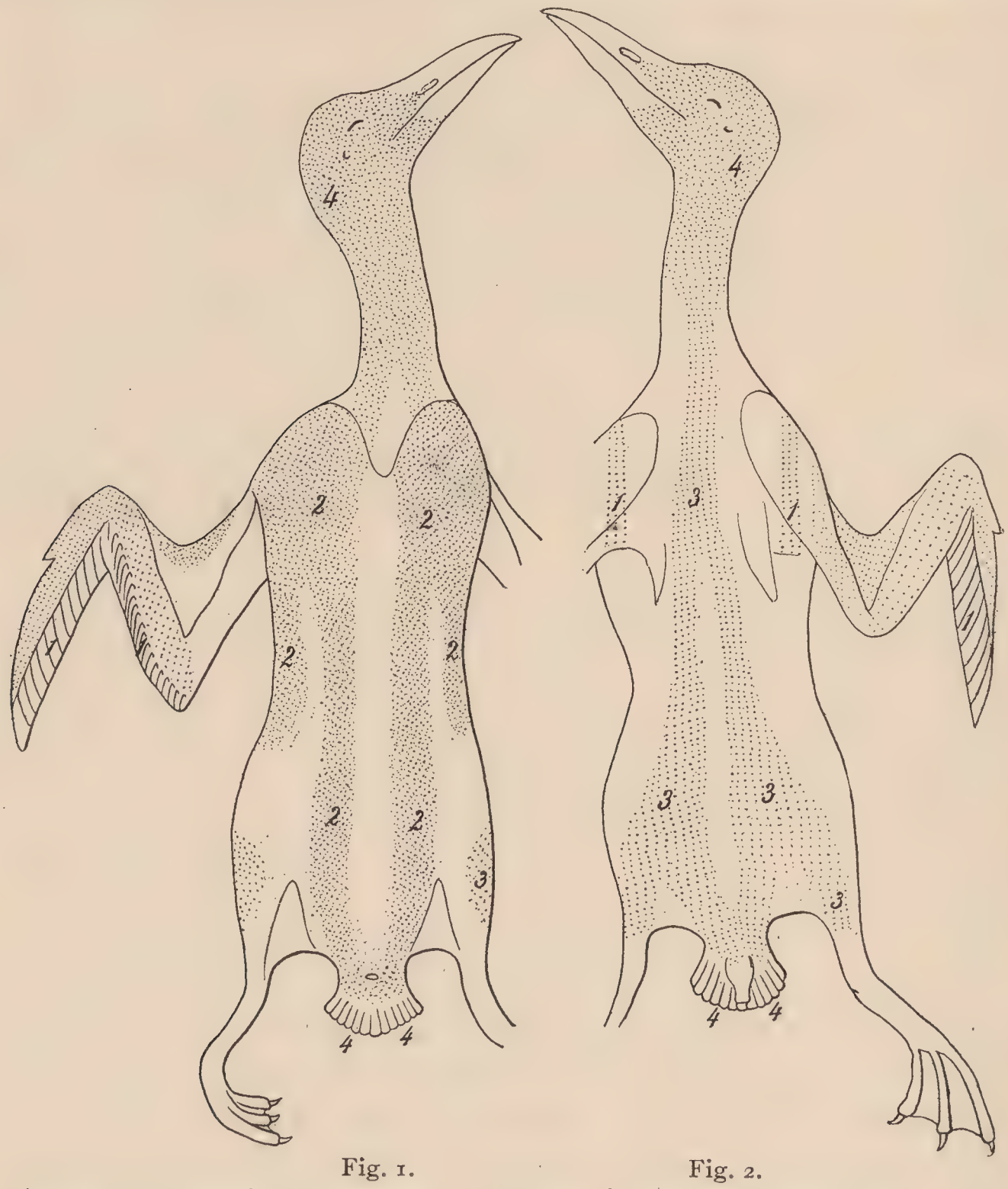

Fig. 1. Fig. 2.

Diagrams of pterylosis of *Uria lomvia*, to illustrate growth of plumage. Fig. 1, ventral surface. Fig. 2, dorsal surface. The numbers on the pterylæ refer to the stages as described in the text.

out the *pteryla capitis* and the primary coverts and rectrices can be discerned.

Stage 5.—So far as new growth is concerned this stage is marked by the appearance of the inferior wing-coverts. Specimens are lacking to show the subsequent development of the plumage; the down has largely disappeared from the central

portions of the body, but is still abundant on the thighs, crown, sides and back of the neck, and throat, these parts of the body, with the under wing-coverts, being evidently the last to acquire the second, or flight plumage. The difference in size between stages 1 and 5 are shown by the following measurements: Stage 1, culmen, 55; middle toe, 1.05; stage 5, culmen, 70; middle toe, 1.40 in. In spite of this increase in stage 5, the egg-tooth is still present.

["These stupid birds make no attempt at nest-building, but each deposits its single egg on the bare ledges of rock. They crowd the ledge until there is a continuous scramble to retain a footing, and many eggs are destroyed during these struggles. As soon as incubation is completed, the young are transferred to the water, and mother and young immediately leave the breeding locality; often going quite a distance to sea. The young are perfectly at home in the water and are very expert divers."—J. D. F.]

8. Alca torda. Razor-billed Auk.—Twenty-three males and 11 females, collected by Professor Dyche at Holsteinborg, June 19 to July 5, are remarkably constant in size and color, there being but slight individual and no apparent sexual variation.

9. Alle alle. Dovekie.—Four specimens from English Gulf, July 31; 3 from Parker Bay, August 10; 7 from Cape York, August 9, and 3 without data. Nine of the Cape York and Parker Snow Bay specimens are birds of the year, two of which have almost acquired their second plumage, the downy natal plumage having nearly disappeared. One of these (No. 67755, ♀, Parker Snow Bay) resembles the adult winter bird in being wholly white below, the throat and upper breast washed with dusky, while the remaining eight young birds have the throat and breast blackish, as in the summer adult. I am at loss to account for this difference in color of birds of the same age. It apparently has not been previously described.

["To me, the Dovekie was the most interesting, as well as the most numerous bird observed, and it is surprising that they survive the persecution to which they are subjected. During years when game is scarce, the natives depend almost entirely on the Dovekie for food, and they are caught by the thousands and

stored in great piles for winter use. Without the Dovekie, the little tribe of North Greenland Eskimos would long since have perished of hunger. The ground about their villages is thickly strewn with the bones of the Dovekie, giving abundant proof of the millions which have been devoured. When on the water, they are entirely safe from the natives, but seem to be very stupid when on land and are then easily captured with nets. When one alights on a rock, it is immediately joined by others, until there is a struggling mass, as if it were the only rock in the neighborhood on which to alight. At such times they are easily approached and the quick use of a net or a well directed stone usually results in the destruction of a number. The Dovekie is very peculiar for its flight lines; those leaving the nest being on a lower plane than those approaching. Each day they select a different line of flight and each flock follows exactly the line of its predecessor. While at Meteorite Island in 1896, not a Dovekie was seen, but in 1897 thousands were seen every day during my stay. At this point, Melville Bay is thickly studded with icebergs and each day the Dovekie would select a new line of flight, and when deflected by the firing of guns, would immediately return to the proper course and continue it as far as I could see them from the 600-foot cliffs above. The nest is placed among the loose boulders at the foot of the cliffs and the eggs and young fall an easy prey to the Foxes, Ravens, and Glaucous Gulls."—J. D. F.]

10. Megalestris skua. SKUA.—["Three or four individuals on the south side of Olrik Bay, and as many more off Disko Island, were the only ones noted. They were very shy and nothing was learned of their nesting habits."—J. D. F.]

11. Stercorarius pomarinus. POMARINE JAEGER.—Three adults in the light phase of plumage, from Holsteinborg.

12. Stercorarius parasiticus. PARASITIC JAEGER.—Six adults, five in the light, and one in the dark phase of plumage, from Holsteinborg.

13. Stercorarius longicaudus. LONG-TAILED JAEGER.—Two adults in the light phase of plumage, from Holsteinborg.

14. Pagophila alba. Ivory Gull.—Two immature and one adult, collected by Kock at Sukkertoppen, October and November, 1892.

15. Rissa tridactyla. Kittiwake.—The collection contains eight adults and a large number of nestlings, taken at Parker Snow Bay, August 10 and 11, by Mr. Figgins. The series of young in connection with several specimens collected by the writer on Bird Rock, Gulf of St. Lawrence, represents every age from the newly hatched bird to one full feathered and about to fly, and therefore furnishes excellent material for a study of the growth of plumage in the immature bird of this species.

Growth of Plumage.

Without attempting a description of the pterylosis of the Kittiwake, which the nature of the specimens at hand (dried skins) does not warrant, I present two figures of its pterylæ, drawn from a plucked skin, in order to graphically illustrate the development of its plumage. (Figs. 3 and 4.)

Beginning with the newly hatched chick its gradual feathering may be described under stages, the age of which cannot, unfortunately, be stated, but some idea of the increase in size may be gained from the measurements of the exposed culmen and middle-toe with nail, given with each stage.

Downy stage, newly hatched chick.—Culmen, .49; middle toe, .80 in. Entirely covered with down with the exception of small naked spaces on the sides of the neck (*a*), and sides of the body under the wings (*b*), these apteriæ being separated from each other by the lateral extension of the *pteryla gularis* at its junction with the *pteryla humeralis*. Later these spaces become covered with down.

Stage 1.—Culmen, .60 (egg-tooth present); middle toe, 1.20 in. Feathers, tipped with the down they are replacing, are just protruding from the skin on the *pteryla humeralis*, the lateral branch of the *pteryla ventralis*, and the radio-ulnar portion of the *pteryla alaris*, where apparently all but the lesser secondary coverts can be seen. Feathers seem to appear simultaneously on the parts named, there being no appreciable difference in the size of the feathers growing on them.

Stage 2.—Culmen, .64 (egg-tooth absent); middle toe, 1.25 in. The first indication of primaries is now observed, the black lesser wing-coverts are evident, and the entire anterior portion of the *pteryla dorsalis*, the lateral extensions of the *pteryla gularis*, and the *pterylæ femorales* show new feather growth.

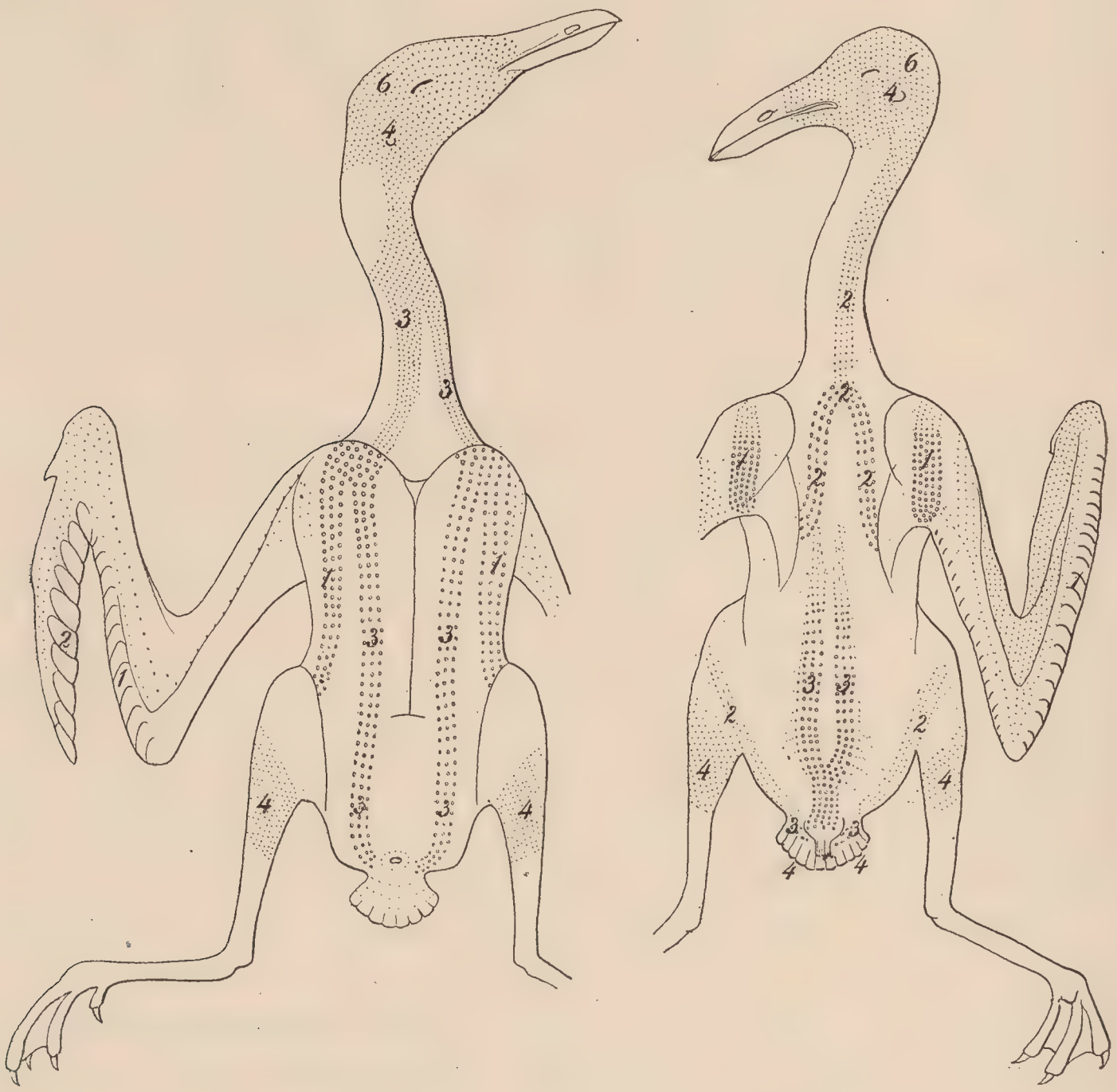

Fig. 3. Fig. 4.

Diagram of pterylosis of *Rissa tridactyla*, to illustrate growth of plumage. Fig. 3, ventral surface. Fig. 4, dorsal surface. The numbers on the pterylæ refer to thestages as described in the text.

Stage 3.—Culmen, .71; middle toe, 1.41 in. The primaries have grown rapidly and are now somewhat in advance of the secondaries, their superior coverts have appeared, and feathers are now for the first time observable on the thumb, the main portion of the *pteryla ventralis*, from the point of the bifurcation on the neck to the vent, the posterior portion of the *pteryla dorsalis*, and *pteryla caudalis*, where only the contour feathers are to be seen, the rectrices not being as yet evident. At this stage the

down of the apteriæ all over the body is being replaced by the down of the fully grown bird, the feathers, as in the case of those growing from the pterylæ, appearing from the same pit as the natal feather which precedes them, and for a short time adheres to the tip of the new feather.

Stage 4.—Culmen, .78 ; middle toe, 1.45 in. The black tips of the rectrices are now just discernible ; black is also evident in the auriculars, marking the first appearance of new feathers on the *pteryla capitis*, and feathers are growing on the *pterylæ crurales*.

Stage 5.—Culmen, 1.01 ; middle toe, 1.70 in. New feathers are now growing throughout the *pteryla capitis*, except at the base of the bill, the inferior primary coverts are appearing, and, in short, all the feather tracts are now supporting new and growing feathers.

Stage 6.—Culmen, 1.10 ; middle toe, 1.75 in. No new tracts are involved in this stage, which simply marks the completion of the plumage in which the bird makes its first flight. The last parts of the bird to acquire the new plumage are the extreme anterior parts of the *pteryla capitis*, about the base of the bill, and the lower portions of the *pterylæ crurales*.

Generally speaking, therefore, it seems that in the young Kittiwake feathers appear first on the middle of the body ; that the secondaries appear before the primaries ; that all the wing feathers are evident before the tail is observable, and that the last portions of the bird to complete the new plumage are the anterior parts of the head and extremities of the feathered part of the tibiæ.

Relationships with *Rissa tridactyla pollicaris*.

The large number of adult Kittiwakes in the Museum collection has led me to make a comparison of the Atlantic form with that found in the North Pacific (*R. t. pollicaris*), the standing of which has been lately questioned by Mr. Howard Saunders.[1]

Among my series of 25 adult Atlantic birds, there are specimens having the hind toe fully as much developed as in any one of my six examples of *pollicaris*, and I quite agree with Mr. Saunders that this character is too inconstant to be considered of even subspecific value. As Dr. Stejneger[2] has pointed out,

[1] Cat. Birds B. M., XXX, p. 310.

[2] Orn. Ex. in the Comm. Is., p. 80.

however, the black apices of the primaries are of greater extent in the Pacific bird than in examples from the Atlantic, and the specimens under consideration support his statement. Measurements of the black tip of the first primary of 25 Atlantic and 5 Pacific specimens gives the following result: Atlantic, extremes, 2.00–2.70 in., average, 2.35 in. Pacific, extremes, 3.00–3.30 in., average, 3.15. Thus the specimen of *tridactyla* having the most black at the apex of the first primary is still less black in this region than the specimen of *pollicaris* having the least black, and this difference, though slight, seems to be constant enough to warrant the continued subspecific separation of the Atlantic and Pacific birds. These differences are well shown in Figures 5 and 6.

Fig. 5. Tips of three outer primaries of *Rissa tridactyla*. Two-thirds nat. size. Coll. Am. Mus. Nat. Hist., No. 67725.

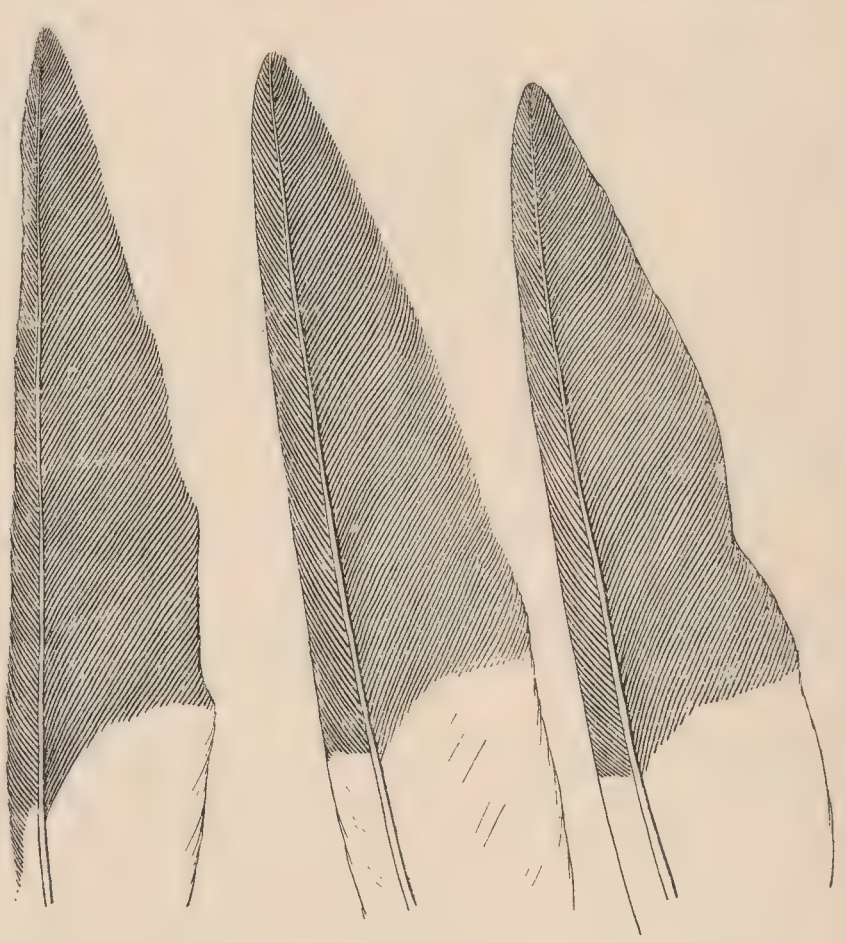

Fig. 6. Tips of three outer primaries of *Rissa t. pollicaris*. Two-thirds nat. size. Coll. Am. Mus. Nat. Hist., No. 61516.

[“The largest colony visited was on the south side of Saunders Island, where about 2000 pairs occupied a deep bay-like depression of the cliff. The nest is composed of fine grasses, very compactly built, and having the appearance of being repaired and added to each year, which resulted in many of the nests being more than a foot high. Two constitutes the usual brood, but only one is sometimes found.”—J. D. F.]

16. Larus glaucus. GLAUCOUS GULL.—Three adults from Holsteinborg; two from Parker Snow Bay, August 11; two from north side of White Strait, July 26; two from Kahkoktah Cove, September 1; one from Duck Island, August 2; one bird of the year from Anniversary Lodge, September 11, and one from Bowdoin Bay, September 9.

["High up on nearly every cliff which is near the sea, one or two pairs of these Gulls were found breeding. In all cases, the nest is inaccessible from below, but it is sometimes possible to reach it from above. The nest is usually in a depression of the ledge of rock, fine grass being used as a scant lining. Two young were found in all nests examined, and they always varied greatly in size. Several pairs of the old birds were always seen about the breeding places of the Dovekies and Murres, swooping down upon the defenceless young."—J. D. F.]

17. Sterna paradisæa. ARCTIC TERN.—Five adults from Holsteinborg; 13 from Disko Bay and Island, August 3, and 6 from Olrik Bay, August 14; 1 immature in the *S. portlandica* plumage from Jacobshaven without date of capture.

["About the south end of Disko Island this Tern was abundant in 1896, but in 1897 none were seen. I could learn nothing of their breeding habits at this point. The shores of Disko Island are high and abrupt and offer no suitable locality for breeding, unless the birds repair to the higher ground, which I think is doubtful."—J. D. F.]

18. Fulmarus glacialis. FULMAR.—In a series of 32 Fulmars, 25 represent the light phase, 6 the gray, and 1 is intermediate. It is interesting to observe that irrespective of color phase the downy under plumage is of a uniform slate color.

Comparison of the specimens included in this series raises a doubt as to the validity of the so-called *Fulmarus glacialis minor*, the differences in size claimed for this form being in my opinion ascribable to sexual and individual variation. In support of this view I append the following tables of measurements which show the extent of sexual and individual variation in series taken at the same place on the same day:

Measurements of Male Fulmars.

Locality.	Date.	Length	Wing.	Culmen.		Phase.
				Length	Depth at Base.	
Holsteinborg	June 19, 1895	19.75	12.50	1.50	.75	Light.
"	" "	19.00	12.40	1.50	.68	"
Godhaven	July 21, 1895	19.50	12.50	1.45	.72	"
"	" "	19.50	12.75	1.50	.70	"
"	" "	19.25	12.75	1.50	.78	"
"	" "	19.50	13.00	1.45	.80	"
"	" "	19.75	13.50	1.45	.80	"
"	" "	19.25	13.25	1.52	.82	"
"	" "	19.50	12.75	1.55	.80	"
"	" "	20.00	13.00	1.50	.75	Gray.
"	" "	20.35	13.40	1.50	.80	"
Upernivik	Aug. 3, 1896	.....	11.50	1.40	.75	Light.
"	" "	.....	12.00	1.40	.75	"
"	" "	.....	13.00	1.45	.78	"
"	" "	.....	12.75	1.50	.80	"
	Average.....	19.58	12.75	1.48	.77	

Measurements of Female Fulmars.

Locality.	Date.	Length	Wing.	Culmen.		Phase.
				Length	Depth at Base.	
Holsteinborg	June 15, 1895	18.00	12.12	1.35	.70	Light.
"	" "	19.00	12.90	1.45	.72	"
"	" "	18.00	11.75	1.38	.68	"
"	" 26 "	19.75	13.50	1.50	.70	Gray.
"	" 16 "	17.00	12.00	1.50	.67	"
Godhaven	July 21, 1895	18.35	11.12	1.40	.70	Light.
"	" "	18.80	12.80	1.50	.78	"
"	" "	18.50	12.10	1.30	.70	"
"	" "	18.75	12.50	1.45	.75	"
"	" "	18 00	12.50	1.30	.70	"
"	" "	17.25	10.50	1.32	.74	"
"	" "	17.50	12.50	1.35	.72	"
"	" "	17.75	12.25	1.35	.72	Gray.
"	" "	18.00	12.30	1.40	.70	"
"	" "	19.50	12.50	1.50	.78	"
	Average.....	18.28	12.22	1.40	.72	

[“Abundant all over Davis Strait; it is to be seen more than one hundred miles from shore and seems at all times to be free from the cares of nest building and rearing of young. During the heavy storms or while circling back and forth over the ice fields, it seems perfectly contented. The only place I saw it alight on land was at Saunders Island, where I believe it breeds. They were very high up the cliff at that point and many were circling near the top, which is a usual habit. The top of the island at that point was inaccessible, and I am unable to state positively as to their breeding. I am informed by the sailors of whaling vessels that it breeds on the north side of Jones Sound, which is on the American side of Davis Strait.”—J. D. F.]

19. Merganser serrator. Red-breasted Merganser.—One adult female, Holsteinborg; two young in down without data.

20. Anas boschas. Mallard.—One adult female and one young in the down. Holsteinborg, July 18.

21. Anas penelope. Widgeon.—One adult female, near Holsteinborg, October, 1894. (Secured from Müller.)

22. Harelda hyemalis. Old Squaw.—One adult male and one adult female, Holsteinborg; one adult female, Olrik Bay, August 15.

23. Histrionicus histrionicus. Harlequin Duck.—Two adult males, Sukkertoppen, October, 1892 (Kock); one adult male, Niakornat, August 5, and four adults without data.

[“On the south side of Olrik Bay two pairs were found breeding in 1896. Seven young about half grown were found in one brood, and about the same number, but very recently hatched, in the other; while securing some specimens of the larger birds the smaller brood left the lake and entered the grass where I was unable to find them. The nest is a very compact structure of moss and fine grasses. It is very shallow and not more than three inches above the water.”—J. D. F.]

24. Somateria mollissima borealis. Greenland Eider.—This Eider is represented by forty specimens, in five plumages, which may be described as follows:

Downy young (10 specimens, Holsteinborg, July 30, Wilcox

Head, Aug. 6 and 10).—These specimens are in the well-known grayish brown plumage in which the sexes appear to be indistinguishable.

Immature male, nuptial plumage (2 specimens, Holsteinborg, June 19 and 22).—These birds bear a general resemblance to breeding females from which, however, they differ in many respects. The whole abdominal region is grayish brown, uniformly and narrowly edged with buffy, while in the female the sides are buffy conspicuously barred with black, and the centre of the abdomen is grayish brown unmarked. The immature male further differs from the female in having a whitish band across the upper breast, a large black or blackish patch on the sides of the head, and in the absence of the bars on the upper parts, which are grayish brown more or less narrowly margined with pale buff, the lower back being blackish with slight indications of rufous edgings. Material to show the character of the plumage succeeding the one just described is unfortunately lacking; in both these specimens, however, new black feathers are appearing in the upper tail-coverts, the scapulars and anterior part of the back, presenting, therefore, a condition similar to that found in specimens of *Somateria spectabilis* of the same age.

Adult male, nuptial and post-nuptial plumages (12 specimens, Holsteinborg, June 13 to July 19; north side of White Strait, July 26; Greenland, July 28).—The well-known nuptial plumage, which requires no description, is evidently followed, as in the case of *Somateria spectabilis*, by a post-nuptial plumage resembling, in a general way, that of the winter female. In nine of the twelve specimens this post-nuptial plumage is more or less evident. It begins to appear as early as June 13 and is first shown on the anterior part of the back, No. 64310, taken on the date mentioned, having new black feathers growing in that region. In No. 64306, June 28, black feathers are appearing in numbers on the anterior parts of the back, scapulars, and upper tail-coverts, and new blackish feathers are replacing the white ones of the neck, all around, and on the throat and cheeks. By July 6, the molt has reached the breast, sides, and anterior half of the back, and its most advanced state is shown by No. 64118, July 28, which is in much the same condition as No. 64329, *Somateria spectabilis*, Holsteinborg, June 21,

elsewhere described. In addition to the new black or blackish feathers which have appeared or are growing on the rump, scapulars, anterior half of the back, neck all around, throat and sides of the head, grayish brown feathers are coming in on the crown, barred black, white and rufous feathers on the breast, and black rufous barred feathers on the sides. As with *Somateria spectabilis* my material does not fully show the nature of this post-nuptial plumage, but a specimen of *S. mollissima*, No. 853, Denmark, Dec. 2, 1875, indicates that, as suggested with *Somateria spectabilis*, the adult black and white plumage is re-acquired during the late autumn.

This Denmark specimen is in mature plumage, but has throughout the anterior parts of the body, including the head and neck, numerous blackish feathers which are apparently the remains of an old plumage almost replaced by new buffy, white, or greenish feathers, which are still appearing in the parts named.

Female, winter plumage.—This plumage is represented by one specimen in the Dutcher Collection, No. 64781, Montauk Point, L. I., March 25, and two specimens of *S. mollissima* in the U. S. Nat. Mus., No. 113193, Bergen, Norway, Dec. 20, and No. 85983, Spitzbergen. These birds are similar in color to *S. spectabilis* in corresponding plumage. The upper parts are black or blackish broadly margined with rufous; the under parts are fuscous or blackish obscurely barred on the middle of the abdomen, with the sides conspicuously barred with black and rufous and the wing-coverts more or less tipped with white.

As with *Somateria spectabilis* the breeding plumage appears to be acquired by a wearing and fading of the plumage, producing a remarkable change in the bird's appearance, one which it is difficult to believe could be accomplished solely by the agencies of bleaching and abrasion.

Female, breeding plumage (16 specimens: 2, Holsteinborg, June 19; 10, Duck Island, July 31; 1, north side of White Strait, July 26; 3, Wilcox Head, Aug. 6).—With the exception of the two Holsteinborg specimens, this series is very uniform in coloration. The upper parts and breast are barred and margined with pale rufous or buff, the head, throat, and neck all around are evenly streaked with buffy and black, the latter prevailing on the crown; the centre of the abdomen is grayish brown or fulvous

unmarked ; the sides are conspicuously barred with buff and black ; the wing-coverts show more or less evident white tips. These birds are in very worn plumage and were evidently breeding ; in fact, the specimens taken at Wilcox Head are said by Mr. Figgins, their collector, to have had young. The two Holsteinborg specimens above referred to are in less worn plumage and one especially resembles winter birds, and its condition forms a transition stage between the rich rufous and black winter plumage and the faded black fuscous and buff breeding dress.

It is possible that this species may breed later than *S. spectabilis*, only 3 of the 16 females showing traces of molt. In these, new rufous and black feathers of the winter plumage are appearing in the tertials.

Relationships with *Somateria borealis*.

Comparison of 16 adult male Eiders, of which 12 are from Greenland, 1 from Iceland, 1 from Denmark, and 2 from Norway, shows that the only apparent color difference between the New and Old World birds is to be found in the breast, which in *mollissima* is vinaceous-buff and in *borealis* cream-buff. This difference is striking, but I cannot state whether it is not wholly or in part seasonal, my specimens being unfortunately not comparable as regards date, the Old World birds having been taken in the winter, while those from Greenland were secured during the summer. I believe, however, that the difference in color mentioned is, in part, at least, characteristic and will always serve to distinguish birds in full plumage. The only noticeable difference in size is to be found in the length of the bill, which is greater in *mollissima* than in *borealis*, as the following measurements show :

S. mollissima, four specimens : Length of bill, from posterior margin of naked side of culmen to tip, extremes, 2.98–3.20, average, 3.05 ; depth of upper mandible at base of feathered V on culmen, extremes, .90–1.04, average, 1.00. Ratio of length to depth, .32.

S. m. borealis, twelve specimens : Length of bill from posterior margin of naked side of culmen to tip, extremes, 2 55–2.80, average, 2.67 ; depth of mandible at base of feathered V on culmen, .96. Ratio of length to depth, .32. The accompanying

figures (Figs. 7 and 8) indicate the difference in the shape of the bill.

I do not observe any constant difference in the falcation of the tertials, as has been claimed to exist between these two races, but, in my opinion, the differences above mentioned are quite sufficient to warrant us in recognizing the New World Eider under the name *Somateria mollissima borealis* (Brehm).

Fig. 7. Outline of bill of *Somateria mollissima*. Nat. size. Coll. U. S. Nat. Mus., No. 113190.

Anas borealis Gm., based on Pennant's description of the Gulaund Duck of Iceland, supposed by Salvadori to be "the same as *Somateria mollissima*," I do not consider identifiable.

My thanks are due Dr. C. W. Richmond for the loan of specimens of *Somateria mollissima* from the collection of the U. S. National Museum. »

Fig. 8. Outline of bill of *Somateria m. borealis*. Nat. size. Coll. Am. Mus. Nat. Hist., No. 64307.

["This handsome Duck was found breeding at all the places visited. It prefers the small islands lying some distance off-shore, but also breeds on the mainland. Its nest is usually well up the cliffs, and in some cases quite a distance from shore. One nest containing four eggs was at an altitude of about 450 feet, and more than three-quarters of a mile from shore.

Dalrymple Rock is the favorite breeding-place of this species;

it is much broken, and the many ledges offer fine nesting sites. There is a heavy growth of grass on these ledges, and the nest, when it has been used for many years, is a depression in the sod, lined with the down from the breast of the female. As soon as incubation begins the male birds form into flocks of from 4 or 5 to 20, and seem to be always on the wing. There is a constant line of the male birds flying around Dalrymple Rock, all going in the same direction. As soon as incubation is completed, the young are transferred to the water where they seem perfectly at ease, even when there is a heavy sea running."—J. D. F.]

25. Somateria spectabilis. KING EIDER.—The King Eider is represented by 17 specimens, which, in connection with a series of 21 examples in the Dutcher Collection, from Long Island, throw some light on the various plumages this species assumes.

PLUMAGE OF THE MALE.

Fully grown males are shown in five plumages, as follows: Immature, first nuptial, post first nuptial or second year, second nuptial or mature, post second nuptial, and second winter.

Immature or First Fall Plumage.—(Three specimens: Dutcher Collection, No. 64791, Amagansett, L. I., Dec. 7; No. 67931, Montauk Point, Nov. 25; No. 67928, Montauk Point, Nov. 25.) Specimens in this plumage are practically indistinguishable in size, color, or in the shape of the bill from June females taken at Holsteinborg; No. 67928, however, is beginning to change into the

First Nuptial Plumage.—(Five specimens: Holsteinborg, June 12–22.) Specimens in this plumage present some variation *inter se*, in regard to the amount of black or white present, but in general they may be said to differ from immature birds in having more or less white on the body anterior to the wings, on the sides of the lower neck, and in a band across the upper breast, and in the presence of black along the sides and in the scapulars. In two specimens there is a decided indication of the **v**-shaped throat mark.

This plumage is apparently followed by one in which birds of the second year, and mature birds in the fall and winter, are indistinguishable. Before describing this, however, I may first mention the

First Nuptial or Second-Year Plumage.—(Nine specimens, Dutcher Coll., Long Island, N. Y., Nov. 25 to March 19.) In this plumage the top and sides of the head are ruddy chestnut brown, obscurely barred with black, the throat and a band around the neck dusky, the scapulars and sides black, while the rest of the plumage resembles that of the immature bird in the first fall.

As has just been stated, there is ground for the belief that this plumage represents the post-nuptial dress of the mature bird, and as far as the change has occurred, the specimen, No. 64329, described above, agrees with the Long Island birds. How long this plumage is worn and whether that of the adult is regained before winter, appears to be unknown. Specimens in mature breeding dress are, I believe, unknown on our coasts in the winter, and whether the Long Island specimens are all birds of the second year or in part adults in winter plumage, is uncertain. Judging from the appearance of the sides of the culmen, three of the birds are adult, this marked space being as large as in some mature specimens in breeding dress, while in the remaining six examples it is as small as in immature birds. These facts would indicate that the adult bird might wear the brownish plumage until the spring molt, but, on the other hand, a male, No. 26894, in the Museum Collection, taken by Müller at Manortalik, Greenland, Feb. 22, 1881, is in full breeding costume.

However this may be, there seems no reason to doubt that the adult male does assume for a greater or lesser period the plumage here described, and there is also evidence showing that it represents the first nuptial of the second year, as was stated in describing birds of that age. This evidence is to be found in several of the immature June males from Holsteinborg, which are molting into a plumage resembling that of the Long Island winter birds.

From this post-nuptial or second year's plumage, the birds evidently pass directly into the mature breeding plumage. This is well shown by several examples in the Dutcher Collection which present several stages of the spring molt. This apparently begins late in December and is first shown in the upper tail-coverts, scapulars, extreme anterior portions of the back, lower hind neck and sides immediately in front of the wings, and thence backward along the flanks. No. 64793, Montauk Point,

Jan. 3, 1894, is in the condition above indicated. New black, upper tail-coverts and scapulars are appearing, numerous black feathers are coming in on the sides and flanks, and on the region before the wings and anterior to the interscapulars there are large numbers of growing white or creamy feathers having a black tip, which later would have been worn off. In No. 64795, the molt is more advanced in the parts already mentioned, while patches are beginning to appear on either side of the rump, the lower throat is white and the black V-shaped mark on the upper throat is strongly outlined, while scattered through the anterior half of the top of the head are numerous ingrowing bluish feathers of the adult plumage. No. 64783, Montauk Point, March 19, 1887, is in a far more advanced condition. The head, neck all around, and breast are in mature plumage with only a little of the winter plumage remaining ; the upper tail-coverts are wholly black, the lateral rump patches white, while molt is in progress in the scapulars and along the sides.

Second Nuptial or Mature Plumage.—(Three specimens : Holsteinborg, June 21, July 6, and one, R. E. Peary, no date or locality.) This plumage is too well known to require description ; the condition of No. 64329, however, supports Mr. Murdoch's statement that after the breeding season males assume a plumage resembling in a general way that of the female.[1] This specimen was taken at Holsteinborg, June 21, and the early date indicates that the males may begin to molt as soon as the female commences to incubate. It was evidently in mature plumage, as the black border at the lower part of the large, rounded side of the culmen, greenish patches at the base of the bill, cream breast, and adult plumaged posterior parts of the body show. Throughout the anterior parts of the body molt is in active progress and the feathers of the adult plumage are being replaced by buffy or rufous black-barred feathers resembling those of the immature bird. This change is most striking on lifting the feathers of the breast, which, superficially, is cream-colored, unmarked, but is found to have numerous new barred feathers sprouting at the bases of the cream-colored plumage of the breeding plumage. The black scapulars are being replaced by

[1] Report of the Expedition to Point Barrow, Alaska, p. 121.

new feathers of the same color, but in the posterior parts of the body, molt can be detected only in the upper tail-coverts and in the white patches at either side of the rump, where new black feathers are appearing.

The material studied, therefore, while unfortunately insufficient to definitely explain the plumage changes of the King Eider, indicates with considerable clearness (1) that males of the first year have a distinctive nuptial plumage; (2) that this is followed by a post-nuptial or winter plumage of the second year, which they begin to acquire by molt in June; (3) that from this second year's plumage they begin, late in December, to molt into the mature breeding plumage, which is thus acquired the second year; and (4) that this mature plumage is in part replaced through a molt, which begins in June, by a post-nuptial plumage, affecting the brighter parts of the plumage, and from which, by a second fall molt, they probably return, as in the case of *S. m. mollissima*, to the fully mature dress.

Plumages of the Female.

Twenty specimens represent the female in three quite different plumages: the immature, post-nuptial or adult winter, and breeding, which may be described as follows:

Immature or First Winter Plumage.—(Eight specimens, Dutcher Coll., Montauk Point, Nov. 22 to Jan. 22.) Examples in this plumage are to be distinguished from adults of the same season chiefly by their paler coloration throughout; the upper parts and sides are brownish fuscous, rather narrowly edged with buffy or ochraceous instead of black, widely edged with rufous; the belly is grayish, however, instead of blackish, the wing-coverts are very narrowly, if at all, tipped with white.

As with the males, the molt apparently begins in January and the bird evidently passes into the adult nuptial plumage, which appears to be acquired as early as April 27. No. 64795 *bis*, taken at Montauk Point on this date, being in

Post-nuptial, or Adult Winter or Spring, Plumage.—(Three specimens. No. 26253, Point Barrow, Alaska, May, 21, 1882; Nos. 64121, 64122, Peary, Greenland, no date.) This plumage is characterized by the blackish abdomen, rufous, black-barred breast, black upper parts, margined and more or less barred with rufous,

and white-tipped greater and median wing-coverts. No. 64795 *bis*, Dutcher Collection, Montauk Point, April 27, has nearly acquired this plumage, but the wings still agree with those of the immature bird.

Although this plumage represents the mature spring dress, it apparently is not the breeding plumage ; six June females from Holsteinborg differing materially from those just described as follows :

Breeding Plumage.—(Six specimens, Holsteinborg, June 12–29.) These birds are in very worn plumage, closely resembling that of the immature. Each is acquiring new feathers on the scapulars, upper tail-coverts, upper breast, and along the sides, and these new feathers agree in color with those on the corresponding parts of the birds just described as in adult winter and spring dress, from which they have apparently changed to this breeding plumage by a wearing and fading of the feathers.

26. Chen hyperborea nivalis. GREATER SNOW GOOSE.—One adult specimen in worn plumage procured by Peary.

27. Anser albifrons. WHITE-FRONTED GOOSE.—One adult from Holsteinborg without date. (Secured from Müller.) The measurements are as follows : Wing, 16.50 ; tarsus, 2.90 ; culmen, 2.10. The bird, therefore, seems to be quite as near to *gambeli* as to *albifrons*.

28. Branta bernicla. BRANT.—One adult male, Holsteinborg ; one adult without data.

29. Phalaropus lobatus. NORTHERN PHALAROPE.—Two adults from Holsteinborg and one without data.

30. Tringa canutus. KNOT.—One adult female, collected by Müller at Jacobshaven, June 3, 1894, and one immature specimen without data.

31. Tringa maritima. PURPLE SANDPIPER.—One adult male, Disko Island, August 3, one young in down, Holsteinborg, July 14 ; and four specimens without data.

[" Occasionally seen on the low sandy shores of the bays."—J. D. F.]

32. Numenius phæopus. WHIMBREL.—One specimen, secured from natives at Jacobshaven.

33. Charadrius dominicus. GOLDEN PLOVER.—An adult male, collected by Governor Müller at Jacobshaven, July 2, 1894.

34. Ægialitis hiaticula. RING PLOVER.—One immature specimen without data.

35. Arenaria interpres. TURNSTONE.—One immature specimen from Holsteinborg, August 10; one adult from north Greenland, June 3; and one without data.

["Three specimens, taken at Saunders Island, were all that were observed."—J. D. F.]

36. Lagopus rupestris reinhardti. REINHARDT'S PTARMIGAN.—Two females in summer plumage, Disko Island, July 28; one male, Nuwatak, September 1, and another, Bowdoin Range, August 26, both changing into winter plumage; one female, November 23, one male, April 25, both in full winter plumage; two half-grown young, Disko Island, July 28.

["It is a mystery how the Ptarmigan exists. It is usually found on the higher ground where the vegetation is confined to lichens and a little grass; at one place a brood of about ten was found where the rocks and ground were entirely barren for miles around, except for a little moss in the damp places. Their mottled summer plumage affords them perfect protection from the sharp eyes of the Gyrfalcon, and the natives also, were it not for their habit of running when approached. The native boys kill many of them with stones, in the use of which they are experts at short range."—J. D. F.]

37. Falco islandus. WHITE GYRFALCON.—From Governor Kock, now at Frederickshaab, Professor Dyche purchased a beautifully prepared and well labelled series of 27 Gyrfalcons, and in addition to these birds, the Museum has received from Lieutenant Peary, 6 Gyrfalcons from Godhaven, making, in all, 33 specimens. So far as the relationships of the Greenland birds are concerned, a careful study of this fine series fortunately supports the current view of their distinctness, originally advanced, I

believe, by Hancock in 1854.[1] That is, there are two forms, a light one (*islandus*) and a dark one (*rusticolus*). *F. islandus*, of which there are 18 specimens, is light colored at all ages; the under tail-coverts are immaculate, the tail is barred with fuscous and white bands of equal width, with white bands broader, or the fuscous bands may be entirely wanting. Fourteen specimens are immature, four are fully adult. The former have the under parts more or less streaked with fulvous, though white always predominates. The upper parts are striped with linear or guttate markings, or the feathers may be fuscous margined with white. In adult birds the under parts have few or no markings, and the upper parts are crossed with semicircular or broadly sagittate bars of slaty black.

38. Falco rusticolus. Gray Gyrfalcon.—The series of 14 dark Gyrfalcons (*F. rusticolus* Auct.) presents much variation. Four examples are dark enough to be referred to *F. r. obsoletus*, one of them being fully as dark as the darkest of three specimens from Ungava, Labrador, kindly loaned me by Mr. Ridgway, and warrant the addition of *Falco rusticolus obsoletus* to the Greenland fauna. These birds are connected with the lighter specimens in the series by finely graded stages. Only one bird of the fourteen is adult, that is, in the barred plumage. This specimen is in molt and apparently shows, as Hancock stated, that the change from the linear to transverse markings is accomplished by one molt. Mr. Ridgway has also loaned me several examples of *F. r. gyrfalco*, but the material is insufficient to shed new light upon the relationship of the birds to *F. rusticolus*.

39. Falco rusticolus obsoletus. Black Gyrfalcon.—As above stated, 4 of the 14 Gyrfalcons in the series of 33 are referable to this dark form, one being from Godhaven and three from Sukkertoppen.

40. Falco peregrinus anatum. Duck Hawk.—One adult male and two newly hatched young, from Holsteinborg, June 30.

41. Nyctea nyctea. Snowy Owl.—Two adult specimens, without data.

[1] Ann. and Mag. Nat. Hist., Ser. ii, XIII, p. 110.

42. Corvus corax principalis. NORTHERN RAVEN.—Three immature examples, taken at Holsteinborg, July 12 and 18, and one from Upernivik, August 3, are just completing the acquisition of their glossy adult plumage.

["The only nests of the Raven found were within a few rods of the nest of the Gyrfalcon, and no Gyrfalcon nest was found without its nearby partner the Raven. I was told by Lieutenant Peary and the natives that this is the case almost without exception; why they do this I am unable to say unless the supply of discarded bones from the Gyrfalcon's nests is the attraction to the Ravens. It was impossible to reach the two nests of the Raven I found, so I learned nothing of its structure.

"The Raven becomes very tame and enters the village, and, true to the tradition of its family, is ever searching for plunder, and they give the natives much trouble when drying meat. When on the wing they are usually found in pairs, their favorite haunts being the fjords and small islands near the coast. They are easily attracted by imitating the call of our common crow or their own notes, the natives being very expert in the latter. During the long winter the Raven is the only bird found in North Greenland."—J. D. F.]

43. Plectrophenax nivalis. SNOWFLAKE.—Ten adults from Holsteinborg, all in worn breeding plumage. Two adults from Disko Island, August 3, show the post-nuptial molt well under way, the new brown-tipped feathers being evident throughout the *pteryla dorsalis*, and the brown-tinged feathers of the *pteryla ventralis* are also appearing. The tail and wing feathers are also being replaced by those of the winter plumage.

A fledgling from Holsteinborg, June 17, has the wings well-grown and the tail half-developed, while a series of six young of the year from Disko Island, August 3, are beginning to acquire their winter or second plumage.

The changes of plumage which this species undergoes have already been treated at some length in a former volume of this Bulletin[1], in a paper based largely on the material above mentioned.

["The Snow Bunting in Greenland reminds one very much of our English Sparrow. It spends almost its entire time in the

[1] Vol. VIII, 1896, p. 9.

villages, where it is very common. Soon after its arrival the pure white feathers of the breast are badly soiled with dirt and grease and it is a very different looking bird to our neat winter visitor. About the village there is an abundance of grass which furnishes suitable nesting sites. Arriving after the young had left the nests I could learn nothing of their breeding. While crossing Davis Strait in the fall of 1897 a number of Snow Buntings came aboard ship during a heavy gale. They seemed to be nearly exhausted, and as the Strait is about 700 miles wide at that point, many must perish in attempting the passage."—J. D. F.]

44. Calcarius lapponicus. LAPLAND LONGSPUR.—Four adults from Holsteinborg; two adults and one young in nesting plumage from Disko Island, August 3.

["The habits of this bird are much the same as those of the Snow Bunting; one nest found, composed of fine grasses, contained two young nearly ready to fly."—J. D. F.]

45. Acanthis hornemanni. GREENLAND REDPOLL.—One adult specimen, without data.

46. Acanthis linaria rostrata. GREATER REDPOLL.—Two males and two females from Holsteinborg, the latter taken June 14 and 15 respectively, are labelled as having contained eggs about one fourth of an inch in diameter.

47. Anthus pensilvanicus. TITLARK.—One adult specimen, collected by Müller at Jacobshaven, September 13.

48. Saxicola œnanthe. STONECHAT.—Two adult males, Holsteinborg; one adult female, Anniversary Lodge, September 12; one female in nestling plumage, Upernivik, August 3; and one female without locality. Greenland specimens of the Wheatear *average* considerably larger than those from England, but there appears to be no difference in color between birds from these localities.

["This was decidedly the shyest bird observed. It is next to an impossibility to approach within shot-gun range. They are usually found about deserted villages, often entering the stone houses, and as they are insectivorous the reason for this habit is evident."—J. D. F.]

Article XVIII. — HISTORY AND CHARACTERS OF THE FAMILY NATALIDÆ.

By Gerrit S. Miller, Jr.

Plate X.

On examining a specimen of *Furipterus* among the 'free-tailed bats' in the American Museum of Natural History, I was impressed by the animal's resemblance to members of the genus *Natalus*, for one of which, in fact, I at first glance mistook it. Further study convinces me that this similarity is due to actual relationship, and that *Natalus*, *Thyroptera*, *Furipterus*, and *Amorphochilus* should be united to form a family *Natalidæ* distinct from the Vespertilionidæ, Phyllostomidæ, and Emballonuridæ, to each of which members of the group have been assigned. This family is exactly equivalent to the subfamily Natalini of Winge, regarded by its author as part of the Vespertilionidæ, and essentially the same as the Natalinæ of Harrison Allen, founded as a group of Phyllostomidæ. Before examining the characters of the group it will be of interest briefly to review the history of the four genera. In this I make no attempt at completeness of detail.

The first member of the family Natalidæ to be brought to the notice of naturalists was the genus *Thyroptera*, described by Spix in 1823 ('23, p. 61, pl. xxxvi). Five years later a second genus, *Furia*, was published by F. Cuvier ('28, p. 149). As the name *Furia* had been previously used in another sense by Linnæus ('58, p. 647) it was changed to *Furipterus* by Bonaparte ('37–'37, under *Plecotus auritus*). The third genus, *Natalus*, was described in 1838 by J. E. Gray ('38, p. 496). Gray's account of the original specimen of *Natalus stramineus*, from an unknown locality, was so unsatisfactory that the genus received in 1855 a second and a third name, *Spectrellum* Gervais and *Nyctiellus* Gervais ('55, pp. 51, 84). The year 1854 had brought still another synonym to the group, *Hyonycteris* Lichtenstein and Peters ('54, p. 335). This afterward proved to be the same as the *Thyroptera* of Spix (Peters, '65 *b*, pp. 580–581). The fourth and last known genus, *Amorphochilus*, was not described until 1877 (Peters, '77, p. 185). Still more recently, however, two species

of *Natalus* have been separated from the typical members of the genus under the subgeneric name *Chilonatalus* (Miller, '98, p. 326).

In the systematic arrangement of these few genera authors have shown the widest variance of opinion. Spix regarded *Thyroptera* as a member of the family Anistiophori, a group including all the American bats without nasal appendages ('23, p. 55). F. Cuvier ('28, p. 154) compared the genus *Furipterus* (= '*Furia*') with the Asiatic *Kerivoula*, a member of the family Vespertilionidæ, though without assuming any close relationship. G. Cuvier regarded *Thyroptera* as nearly related to *Molossus* ('29, p. 116); an opinion in which he was followed by Bonaparte ('31, p. 15), Wagner ('40, p. 482) and Cantraine ('45, p. 492). Bonaparte, however, afterward referred the allied genus *Furipterus* to the Vespertilionidæ ('37, in text under *Plecotus auritus*). Gray, in 1838, placed *Furipterus* next to *Natalus* in the 'tribe Vespertilionina' ('38, p. 496). During the same year Gervais described the Cuban *Natalus lepidus* as a member of the genus *Vespertilio* ('38, p. 32). In 1840 the same species was redescribed by Gundlach, who also regarded it as a *Vespertilio*. Wagner's reference of *Thyroptera* to the Gymnura, a group about equivalent to the Molossidæ, was made with much hesitation; at the same time he placed *Furipterus* among the Vespertilionina ('40, p. 549). Afterward, he described a species of *Natalus* under the generic name *Vespertilio* ('45, p. 148). The genus *Mosia*, at first supposed to have come from Brazil, was described by Gray in 1843 ('43, p. 117) and figured during the following year ('44, p. 25, pl. vi.). It proved, however, to be one of the Old World Emballonuridæ (Peters, '65 *b*, p. 480, Dobson, '78, p. 363). Except for Gray's subsequent confusion of this genus with *Furipterus* ('66) it would not be mentioned here. Gervais in 1855 arranged the genera of Natalidæ known to him as follows: *Thyroptera* and *Furipterus* among the 'Emballonurine Vespertilionidæ' ('55, pp. 56, 69), and *Natalus*, specimens of which he supposed to represent two genera, divided between the 'Vampyrine Phyllostomidæ' ('*Spectrellum*,' '55, p. 51), and the 'Nycticeine Vespertilionidæ' ('*Nyctiellus*,' '55, p. 84). Tomes, on the other hand, grouped the same three genera under the Vespertilionidæ ('65, pp. 172–181). He was thus

the first writer to recognize their close relationship. In 1865 Peters published his synopsis of the genera of bats. Here the natural grouping adopted by Tomes is done away with. *Natalus* and *Thyroptera*, it is true, are left in the Vespertilionidæ, but *Furipterus* is removed to the 'Brachyura,' a group containing also the genera *Mystacina*, *Noctilio*, *Taphozous*, *Emballonura* (with *Saccopteryx*, etc., as subgenera), and *Diclidurus* ('65, p. 258). During the following year Gray proposed an arrangement of the Vespertilionidæ and Noctilionidæ differing considerably from the system adopted by Peters. The genera *Natalus*, *Furipterus* (renamed *Furiella*),[1] and *Thyroptera*, all of which Gray appears to have known at first hand, are united with the Old World *Miniopterus* to form a subfamily Natalinia of the family Vespertilionidæ. For the *Nyctiellus* of Gervais (spelled *Nycticellus*), the same as *Natalus*, but unknown to Gray directly, a new subfamily of the Vespertilionidæ, Nycticellina is formed. Another genus based on a species of *Natalus*, *Spectrellum* Gervais, likewise known to Gray by the description only, is made a subfamily (Spectrellina) of the Noctilionidæ. Finally the '*Furipterus* of Bonaparte,'[2] which Gray had never seen, but which he wrongly supposed to be different from that of Tomes, forms the 'subfamily Furipterina,' placed also under the Noctilionidæ. This was apparently due to the misidentification of the *Furia* of F. Cuvier and *Furipterus* of Bonaparte with Gray's own *Mosia* ('66, pp. 90–93). The Natalinia of Gray thus coincides with the Natalini of Winge except that the former includes *Miniopterus* and does not contain *Amorphochilus*, then unknown. Gill essentially followed Peters, though he regarded the genus *Furia* (= *Furipterus*) as representative of a subfamily Furiinæ ('72, p. 18). In 1877 Peters again associated *Furipterus* with the 'Brachyura,' now, however, placing *Amorphochilus* with it and recognizing the two genera as a group 'Furiæ' ('77, p. 185). The classification adopted by Dobson is essentially that of Peters. *Furipterus* ('*Furia*') and *Amorphochilus* are placed among the Emballonuridæ as a group Furiæ, while *Thyroptera* and *Natalus* are united with *Miniopterus* to form the third division of the Vespertilionidæ, the group Miniopteri ('78, pp. 170,

[1] "*Furia*, Temm., *Furipterus*, Tomes, not Bonap."

[2] "*Furipterus*, Bonap. and Gervais, not Tomes = *Mosia*, Gray, *Furia*, F. Cuv."

345). Flower and Lydekker follow Dobson, though removing *Thyroptera* from association with *Natalus* and *Miniopterus*, and placing it alone in the 'Thyropterine division' of the Vespertilionidæ ('91, pp. 664–665, 666). Two important papers on the classification of the Natalidæ appeared in 1892, one by Harrison Allen, the other by Winge. The latter is probably the earlier in point of date. In it for the first time since the publication of Tomes's paper in 1865, *Natalus*, *Thyroptera*, and *Furipterus* are brought together without association with *Miniopterus*. To these is added the genus *Amorphochilus*, unknown to Tomes. The group thus formed, exactly equivalent to the family Natalidæ of the present paper, stands as one of the three primary divisions of the Vespertilionidæ ('92, p. 36). Harrison Allen, from a study of *Natalus* alone, concluded that the genus could not be retained among the Vespertilionidæ. Like Gervais he was impressed by the resemblance of the genus to some of those usually placed among the Phyllostomidæ. To this family he therefore referred the genus as sole representative of the subfamily Natalinæ ('92, pp. 437–439). In a later work, however, he refers to *Thyroptera*, *Furipterus*, and *Natalus* as 'allied' genera, adding that "*Thyroptera* is in close relation with *Natalus*." Though he does not actually refer either to the subfamily Natalinæ, he clearly does so by inference ('94, pp. 23, 55). Zittel mentions *Natalus* among the Vespertilionidæ ('93, p. 578). In the most recent work to treat of the bats as a whole Trouessart divides the genera of Natalidæ among no less than three families. *Thyroptera* forms a section of the Vespertilionidæ, *Furipterus* and *Amorphochilus* stand as a section of the Emballonuridæ, while *Natalus* is removed to the Phyllostomidæ ('97, pp. 134, 135–136). This grouping is simply that of Flower and Lydekker as modified by Harrison Allen in 1892.

The history of the family Natalidæ is summarized in the following table :

History of the Family Natalidæ.

Year.	Author.	Family in which Genus was Placed.		
		Vespertilionidæ.	Emballonuridæ.	Phyllostomidæ.
1828	F. Cuvier.	Furipterus.		
1829	G. Cuvier.		Thyroptera.	
1831	Bonaparte.		Thyroptera.	
1837	"	Furipterus.		
1838	Gray.	Furipterus.		
"	"	Natalus.		
"	Gervais.	Natalus.		
1840	Gundlach.	Natalus.		
"	Wagner.	Furipterus.	Thyroptera.	
1845	"	Natalus.		
"	Cantraine.		Thyroptera.	
1855	Gervais.	Natalus ('*Nyctiellus*').	Thyroptera.	Natalus ('*Spectrellum*').
"	"		Furipterus.	
1865	Tomes.	Thyroptera.		
"	"	Furipterus.		
"	"	Natalus.		
"	Peters.	Natalus.	Furipterus.	
"	"	Thyroptera.		
1866	Gray.	Natalus.	Natalus.	
"	"	Furipterus.	Furipterus.	
"	"	Thyroptera.		
1872	Gill.		Furipterus.	
1877	Peters.		Amorphochilus.	
1878	Dobson.	Natalus.	Furipterus.	
"	"	Thyroptera.	Amorphochilus.	
1891	Flower and Lydekker.	Natalus.	Furipterus.	
		Thyroptera.	Amorphochilus.	
"	" "			
1892	Winge.	Natalus.		
"	"	Thyroptera.		
"	"	Furipterus.		
"	"	Amorphochilus.		
"	H. Allen.			Natalus.
1894	"			Natalus.
"	"			Furipterus.
"	"			Thyroptera.
"	Zittel.	Natalus.		
1897	Trouessart.	Thyroptera.	Furipterus.	Natalus.
"	"		Amorphochilus.	
1898	Miller.			Natalus.

The characters of the group are as follows :

Family Natalidæ.

Small, delicately formed bats with general aspect of the members of the Vespertilionine genus *Kerivoula*. *Ears* widely separate, funnel form, the

opening directed forward ; inner surface of conch smooth or papillose, without cross striations. Muzzle neither simple nor with leaf-like outgrowths, its form occasionally (*Chilonatalus*, *Amorphochilus*) suggesting that of the Lobostomine Phyllostomidæ. *Membranes* ample, thin, and delicate. Thumb variable in form, its phalanges sometimes (*Furipterus*, *Amorphochilus*) rudimentary, the metacarpal never wholly free from membrane. Third manal digit normally with two phalanges, the second of which is longer than the first (in *Thyroptera* the distal phalanx is divided into two). *Skull* Vespertilionine in form, the braincase abruptly elevated above faceline. *Vomer* large, generally fused with posterior edge of bony palate, the anterior extremity always produced as a median spicule appearing at bottom of anterior palatine emargination. In *Thyroptera* the anterior extremity of the vomer is slightly bifurcate, while in *Natalus* it is joined by the palatine processes of the premaxillaries, thus isolating the two small palatine vacuities. *Upper incisors* four, in pairs, each pair widely separated from that of opposite side and from canine. *Lower incisors* six, small but well developed. *Anterior premolars*, both above and below, large, compressed laterally, and with well developed cutting edges. *Maxillary* molars with inner (lingual) side of crown narrow, the protocone well developed, but hypocone rudimentary or absent.

The family Natalidæ unites in a curious manner the characters of the Vespertilionidæ and Phyllostomidæ. In aspect the species are distinctly Vespertilionine, though the peculiar structure of the muzzle, notably in *Amorphochilus* and *Chilonatalus*, distinctly suggests the Lobostomine Phyllostomidæ. The skull is Vespertilionine in form, though the relation of the anterior end of the vomer to the premaxillaries is distinctly Phyllostomine. While the molar teeth and the incisors are perfectly Vespertilionine, the premolars are as clearly Phyllostomine in both size and form. Finally the third manal digit normally contains two phalanges as in the Vespertilionidæ, the distal, however, of unusual length. This long phalanx is divided into two in *Thyroptera*, thus exactly reproducing the normal condition in the Phyllostomidæ. With the Emballonuridæ the group has no close relationship.

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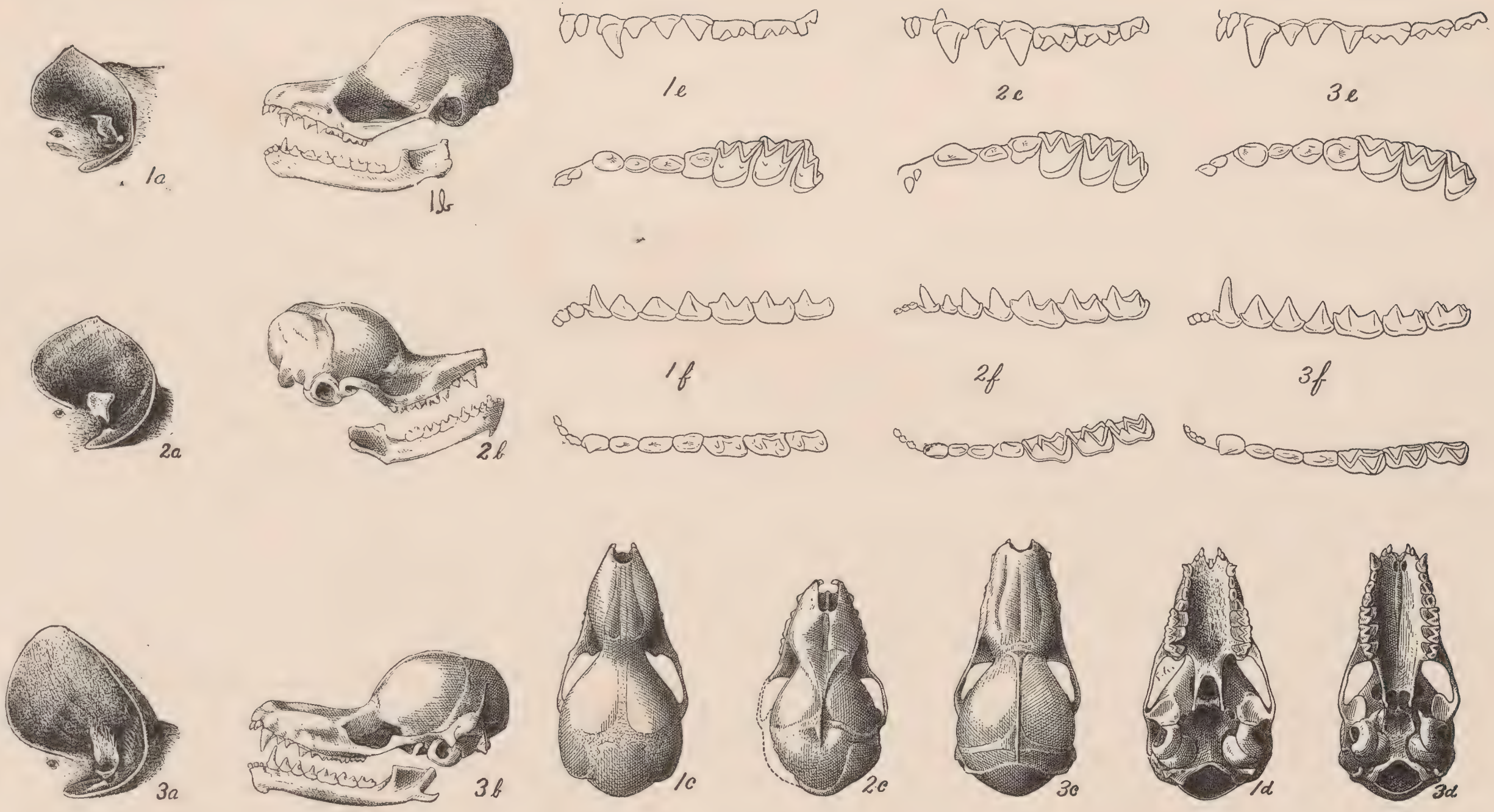
EXPLANATION OF PLATE X.

Fig. 1.—*Thyroptera discifera* (Lischtenstein and Peters).

Fig. 2.—*Furipterus horrens* (F. Cuvier).

Fig. 3.—*Natalus micropus* (Dobson).

For each species *a* = ear (x $1\frac{1}{2}$), *b* = side view of skull (x 2), *c* = dorsal view of skull (x 2), *d* = palatal view of skull (x 2), *e* = maxillary teeth (x 4), *f* = mandibular teeth (x 4).



SPECIES OF NATALIDÆ.

Fig. 1, *Thyroptera discifera* (Licht. & Peters); Fig. 2, *Furipterus horrens* (F. Cuv.); Fig. 3, *Natalus micropus* (Dobson).

Article XIX. — DESCRIPTION OF TWO NEW SUBSPECIES OF *COLYMBUS DOMINICUS* LINN.

By Frank M. Chapman.

The specific names, *dominicus*, and its variant *dominicensis*, have been applied to the small Grebe, which ranges from the Greater Antilles and southern Texas southward to Patagonia, but it appears upon comparison of Cuban with continental examples, that at least two mainland forms of this bird deserve recognition by name. For one, from Matto Grosso, Brazil, I propose the name *Colymbus dominicus brachyrhynchus;* for the other, from Lower Rio Grande, Texas, the name *Colymbus dominicus brachypterus*. They may be distinguished from *C. dominicus* and from each other by the following descriptions :

Colymbus dominicus brachyrhynchus, subsp. nov.

Char. Subsp. — Similar to *Colymbus dominicus* Linn., but with the bill much shorter and more slender, and with less fuscous on the sides and flanks.

Description of Type. (No. 34872, Coll. Am. Mus. Nat. Hist., male, Chapada, Matto Grosso, Brazil, Sept. 19, 1883. Collected by H. H. Smith.) — Head and neck all around plumbeous, the crown greenish ; the throat black, some of the feathers tipped with whitish ; back fuscous with slight greenish reflections ; wing-coverts, tertials, and exposed part of outer primaries fuscous ; basal portion of inner web of first primary white, the white increasing in extent on each succeeding feather until it wholly occupies the seventh to the thirteenth feathers, when it decreases and is replaced by fuscous ; neck fuscous, upper breast washed with brownish, paler on the sides ; sides and flanks washed with fuscous, rest of underparts silvery white, through which shows the fuscous bases of the feathers. Wing, 4.02 ; tarsus, 1.25 ; middle toe, 1.82 ; culmen, .72 ; depth of bill at nostril, .25 in.

Description of Female, No. 34873, Chapada, Matto Grosso, Brazil, Sept., 1883. — Similar to the male but whiter below and slightly smaller. Wing, 3.75 ; tarsus, 1.12 ; middle toe, 1.65 ; culmen, .65 ; depth of bill at nostril .21 in.

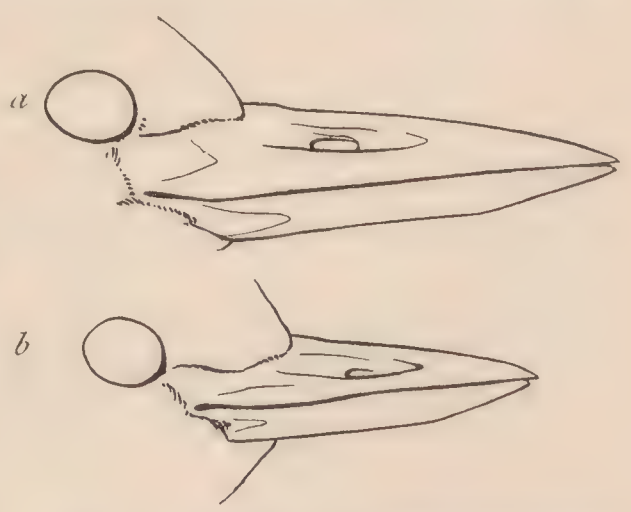


Fig. 1. *a*. Bill of *Colymbus dominicus*. *b*. Bill of *C. d. brachyrhynchus*. Both natural size.

The small size of the bill is the chief distinguishing characteristic of this race, this member being only about two thirds as long as in *Colymbus dominicus*.

Colymbus dominicus brachypterus, subsp. nov.

Char. Subsp. — Similar to *Colymbus dominicus* Linn., but with shorter wings and bill, less fuscous on the sides and flanks, and whiter underparts.

Description of Type. (No. 11, Coll. George B. Sennett, male, Lomita Ranch, Lower Rio Grande, Texas, April 27, 1878. Collected by George B. Sennett.) — Head and neck all around plumbeous, the crown greenish; the throat black, some of the feathers tipped with whitish; back fuscous with slight greenish reflections; wing-coverts, tertials, and exposed part of outer primaries fuscous; basal portion of inner web of first primary white, this white increasing in extent on each succeeding feather until it wholly occupies the seventh to twelfth feathers, when it decreases and is replaced by fuscous; neck slaty, breast washed with brownish, fainter on the sides; sides and flanks washed with fuscous; rest of underparts silvery white, through which the darker bases of the feathers show only slightly. Wing, 3.80; tarsus, 1.25; middle toe, 1.78; culmen, .82; depth of bill at nostril, .30 in.

Description of Female, No. 12, Collection of George B. Sennett, Lomita, Texas, April 27, 1878. — Similar to the male, but whiter below and slightly smaller. Wing, 3.78; tarsus, 1.10; middle toe, 1.62; culmen, .68; depth of bill at nostril, .25 in.

This, the northern continental form of *Colymbus dominicus*, is to be distinguished from *dominicus* by its whiter underparts, smaller bill, and shorter wing; while from *C. d. brachyrhynchus* it may be known by its larger bill, shorter wing, and whiter underparts.

A specimen from Panama is to be referred to this race, while one from Ecuador agrees more nearly with *C. d. brachyrhynchus*. A table showing the bill and wing measurements of males of the three forms is appended:

Name.	No.	Locality.	Wing.	Culmen.	Depth of bill at nostril.
C. dominicus.....	46174	Cuba.	4.15	1.01	.32
"	57299	"	4.10	1.05	.35
C. d. brachyrhynchus..	34872	Matto Grosso, Brazil.	4.02	.72	.25
C. d. brachypterus....	11 G. B. S.	Lomita, Texas.	3.80	.82	.30
"	601 G. B. S.	Hidalgo, Texas.	3.70	.85	.28

List of specimens examined: Cuba, 4; Brazil, 2; Ecuador, 1; Panama, 2; Jalapa, Mexico, 1; Lower Rio Grande, Texas, 21.[1]

[1] From the collection of George B. Sennett, to whom I am indebted for the use of this material.

Article XX.—THE GENERIC NAMES *ECHIMYS* AND *LONCHERES*.

By J. A. Allen.

The generic names *Echimys* and *Loncheres* have a rather involved history. The genus *Echimys* was first named by Étienne Geoffroy Saint-Hilaire, in a work written in "1808 ou 1809," but never published, as we learn from his son Isidore.[1] The name *Echimys* was first published in an abstract of a paper by F. Cuvier, on the dental characters of mammals, in 1809,[2] the entire reference to *Echimys* being as follows: "Dans l' ordre des rongeurs, pour ne parler que des genres, l' auteur établit les suivans, en réunissant les dents semblables, ou en séparant celles qui diffèrent; 1.° avec M. Geoffroy, celui des *Echimys* formé du lerot à queue dorée et du rat épineux de d' Azara."

In 1812, F. Cuvier, in the third part of his 'Essai sur de nouveaux Charactères pour les genres des Mammifères,' treated the genus *Echimys* at length,[3] describing and figuring the dentition of the only two species mentioned by him as belonging to this genus, namely, 'le rat épineux'[4] (pl. xv, fig. 14) and 'le rat à queue dorée'[5] (pl. xv, fig. 15),—the same species originally referred by him to *Echimys*. His description and figures show clearly, however, that the two species are not congeneric, as genera are now recognized, and it becomes necessary to fix upon one of them as the type of *Echimys*.[6]

In 1825 F. Cuvier, in his 'Dents des Mammifères' (p. 185 and pl. lxxiii), again referred to the genus *Echimys* and figured the dentition of *E. dactylinus*. In his reference to the genus he

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[1] Notice sur les Rongeurs épineux, désignés par les auteurs sous les noms d' *Echimys*, *Lonchere*, *Heteromys* et *Nelomys*, par M. Isidore Geoffroy Saint-Hilaire. Mag. de Zoologie, 2° sér., 1840. Mammifères, pll. xx-xxix, pp. 1–57. *Cf.* pp. 1 and 2.

[2] Bull. Soc. philom., No. 24, Sept., 1809, p. 394.

[3] Annales du Mus. d' Hist. Nat., XIX, 1812, pp. 283–285, pl. xv, figs. 14 and 15. This same plate, with these figures, is republished by G. Cuvier, in his 'Ossemens fossiles' (2d ed., V, pt. 1, 1823, pl. i), and his remarks respecting the osteological characters of "Les échimys" are doubtless based on the two species whose dentition is here figured. No particular species, however, is mentioned, beyond what is implied by the reference to the figures.

[4] *Echimys spinosus* Desmarest (1817, *ex* E. Geoffroy, MS.).

[5] *Echimys cristatus* Desmarest (1817, *ex* E. Geoffroy, MS.) = *Myoxus chrysurus* Zimmermann, 1780.

[6] It appears from Desmarest (Nouv. Dict. d' Hist. Nat., nouvelle éd., X, 1817, pp. 54–59), and also from I. Geoffroy Saint-Hilaire (*l. c.*), that E. Geoffroy Saint-Hilaire, in his manuscript work (*circa* 1809), referred seven species of Spiny Rats to the genus *Echimys*. These were first published by Desmarest in 1817, under E. Geoffroy's manuscript names, Desmarest giving "Geof.," "Geoff.," "Geoffr.," or "Geoffroy" as the authority for the names in each

says: "C'est de l'echymys dactylin, jeune encore, de M. Geoffroy-Saint-Hilaire que j'ai tiré ce système de dentition" (p. 186). This species is also not congeneric with either of the two species referred by F. Cuvier to the genus *Echimys* in 1809 and 1812, and all three are now placed in separate genera. His 'echimys dactylin' became, in 1838, the type of *Dactylomys* I. Geoffroy, and in 1843, the type of Lund's genus *Echimys;* his 'rat épineux' is the type of *Loncheres* Illiger, 1811, and congeneric with the type of *Nelomys* Jourdan, 1838; and finally his 'rat à queue dorée' is congeneric with the type of *Mesomys* Wagner, 1845.

Two years after *Echimys* was introduced into the literature of zoölogy, namely, in 1811, Illiger proposed the genus *Loncheres*,[8] on the basis of a formal but rather meaningless diagnosis, and the following: "Species: Loncheres paleacea (nova species e Brasilia) et Hystrix chrysuros *LinGmel.*" As the first species here mentioned remained a *nomen nudum* till described by Lichtenstein in 1820, it cannot be taken as the type, under the A. O. U. Canon XLII, which provides that the basis of a generic or subgeneric name must be either "(1) a designated recognizably described species, or (2) a designated recognizable plate or figure, or (3) a published diagnosis." As *Loncheres paleacea* complies with none of these conditions, his "*Hystrix chrysuros* LinGmel." becomes the type of *Loncheres*. This is in reality the *Myoxus chrysurus* of Zimmermann,[9] variously accredited by later writers to Boddaert, Schreber, Shaw, etc., which was based on 'Le Lérot à queue dorée' of Allemand in Buffon's Hist. Nat., "Suppl. IV, ed. d' Holl. p. 164, pl. 67," and is therefore a prior name for Desmarest's *Echimys cristatus*,[10] Desmarest citing both the "Lérot à queue dorée, Buffon, Suppl., tom. 7, pl. 72," and "*Hystrix chrysuros* Boddaert, Elench. mamm.," these references

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case, except for *E. spinosus*, where it was doubtless accidentally omitted, as this species is also claimed for E. Geoffroy by his son Isidore. These species are as follows:—

1. "Echimys huppé (*Echimys cristatus*) Geof. Lérot à queue dorée Buff., . . . *Hystrix chrysuros* Boddært . . . " (p. 55).
2. "Echimys dactylin, *Echimys dactylinus*, Geoffroy" (p. 57).
3. "Echimys épineux, *Echimys spinosus;* Rat épineux de Azara . . . ; *Echimys roux* Cuvier . . . " (p. 57).
4. "Echimys à aiguillons, *Echimys hispidus*, Geoff." (p. 58).
5. "Echimys didelphoïde, *Echimys didelphoïdes*, Geoff." (p. 58).
6. "Echimys de Cayenne (*Echimys cayennensis*) Geoffr.; d' abord Rat de la Guyane, du même" (59).
7. "Echimys soyeux (*Echimys setosus*) Geoffroy" (p. 59).

[8] Syst. Mamm. et Avium, 1811, 90.
[9] Geograph. Geschichte, IV, 1780, 352.
[10] Nouv. Dict. d'Hist. Nat., nouvelle ed., X, 1817, 55.

being also based on Allemand. It is thus evident that the specific name *chrysurus* of Zimmermann has many years' priority over *cristatus* of Desmarest, both having been founded on Allemand's Lérot à queue dorée. (For the pros and cons of this case, see Isidore Geoffroy Saint-Hilaire, *l. c.*, pp. 6 and 7.) It is further evident that the type of *Loncheres* is the *Echimys cristatus* of recent authors, although Lichtenstein in 1820[1] attempted to restrict the genus *Loncheres* to *L. paleacea*, then for the first time described, he also referring all of the previously described species of *Echimys*, which he saw fit to recognize, to *Loncheres*. His species are (1) *L. paleacea* "Ill.," (2) *L. chrysuros*, (3) *L. rufa* (= *E. spinosus* Desm.), (4) *L. myosurus*, sp. nov. (= *E. cayennensis* Desm.). Later Lichtenstein strangely referred[2] all of these species except *L. paleacea*, to *Mus*, which he retained as the type and only species of *Loncheres*. In 1829 Fischer adopted[3] *Loncheres* for the eight species described by Desmarest and the *L. paleacea* of Lichtenstein, ignoring *Echimys* altogether. On the other hand Rengger in 1830[4] adopted *Echimys*, citing *Loncheres* as a synonym of it. The two species he had occasion to mention are the *E. spinosus* Desm. and *E. longicaudatus*, sp. nov.

In 1837, in an extract from an unpublished paper by Jourdan, F. Cuvier[5] added the genus *Nelomys* Jourdan, with *N. blainvillii*, sp. nov.,[6] as type. According to F. Cuvier, Jourdan joined with this, under *Nelomys*, "l'Echimys huppé" (= *E. cristatus* of authors), which led Cuvier to remark: "Cette réunion suffirait pour indiquer les rapports des Nélomys avec les Echimys, l'Echimys huppé étant le type de dernier genre, si, en effet, les Echimys formaient un genre natural." Cuvier comments on the fact that the group of *Echimys*, consisting of nine or ten species, includes forms that differ much from each other in the structure of the teeth. He also states, as shown above, that he considers l'Echimys huppé (= *E. cristatus* Desm.) as the type of

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[1] Ueber die Ratten mit platten Stacheln. Von Herrn Lichtenstein. (Vorgelessen den 15 Januar 1818.) Abhandl. der Königl. Akad. der Wissen. in Berlin, aus den Jahren 1818–1819, pp. 187–196. The volume is dated 1820.

[2] Darstellung neuer oder wenig bekannter Säugethiere, 1827–1834, pl. xxxv, fig. 1, and pl. xxxvi, with the text belonging thereto.

[3] Syn. Mamm., 1829, pp. 306, 307, 588.

[4] Naturg. der. Saeugethiere von Paraguay, 1830, pp. 233–237.

[5] Rapport sur un mémoire de M. Jourdan, de Lyon, concernant quelques Mammifères nouveaux. Par M. F. Cuvier, Ann. des Sci. Nat., sér. 2, VIII, 1837. *Cf.* pp. 370, 371.

[6] Described in a footnote to page 371, the description being an inedited extract, in marks of quotation, from Jourdan's paper.

the genus *Echimys*, and, further, that l'Echimys dactylin is an aberrant species.

This was the state of the subject when I. Geoffroy Saint-Hilaire, the following year, took up the revision of the American Spiny Rats. His conclusions were first published in abstract in 1838,[1] and in full in 1840.[2] This author, aided by the types of nearly all the species named by his father, E. Geoffroy,[3] and first published by Desmarest in 1817, and thirteen skulls, representing in all ten species, was able to throw great light upon this difficult and as yet very imperfectly studied group. His memoir, as published in full in 1840 (*l. c.*), opens with an admirable historical résumé of the subject, followed by detailed analytical and comparative descriptions of both the external characters and the dentition, rendering, with the accompanying plates (eight illustrating the external features and two the dentition), his memoir of the highest importance as a trustworthy starting point for subsequent investigators. In matters of nomenclature, however, he naturally followed the customs of the day, disregarding the rule of priority, and adopting methods of selecting types for his genera unfortunately contrary to those required by modern rules of nomenclature. Thus, for example, he considered that the species named *chrysurus* (as he supposed by Boddaert, and later adopted by various writers, as Shaw, Lichtenstein, and Fischer) should be eliminated "du système zoologique comme purement nominale," because it "ne diffère pas de l'*Echimys cristatus*," described twenty-five years later. While it is true that the *Lérot à queue dorée* of Buffon was based on an immature specimen preserved in spirits, received through Dr. Klockner from Surinam, and that *Echimys cristatus* was based on an adult example from Guiana, neither I. Geoffroy (*cf. l. c.*, pp. 6, 7, and 49), nor any author who has considered the question, has ever doubted that the two specimens are referable to one and the same species.

In this paper I. Geoffroy added two new species, and divided

[1] Notice sur les Rongeurs épineux désignés par les auteurs sous les noms d'*Echimys*, *Loncheres*, *Heteromys* et *Nelomys*, par M. Isidore Geoffroy Saint-Hilaire. (Présentée à l'Académie des Sciences le 25 juin 1838.) (Extrait.) Ann. des Sci. Nat., sér. 2, X, 1838, pp. 122–127.

[2] Mag. de Zool., sér. 2, 1840, Mammifères, pll. xx–xxix, pp. 1–57.

[3] "Presque tous les originaux des déterminations de mon père existent encore du muséum"; and, he adds, "c'est d'après eux surtout que j'essaierai plus bas la révision de toutes ces espèces, en m'aidant de l'examen de leurs crânes et de leurs dents, et de leur comparaison avec les individus rapportés depuis au muséum par d'autres voyageurs ou décrits par divers naturalistes."—*Mag. de Zool.*, 1840 (*l. c.*, p. 2).

the old genus *Echimys* of F. Cuvier and subsequent French authors into three, namely, *Echimys*, *Nelomys*, and *Dactylomys*, the latter being new. These innovations all date from 1838, being covered by the abstract, although the paper in full was not published till 1840. The three genera are founded mainly on differences in the conformation of the teeth, and on the form and relative size of the feet; the size and shape of the ear, and the condition of the tail as to whether naked or clothed, being considered as not characters of generic importance. His genera (1838) are (1) *Echimys*, with six species, including one new, and one doubtful; (2) *Nelomys*, with also six species, including one new; (3) *Dactylomys*, with one species. These three genera and thirteen species, in the order of the memoir proper (1840) are as follows[1]:

I. Dactylomys.

1. *D. typus* = *E. dactylinus* Desm.

II. Nelomys.

2. *N. cristatus* (Desm.).
3. *N. paleaceus* (Licht.).
4. *N. blainvillii* Jourdan.
5. *N. semivillosus*, sp. nov.
6. *N. didelphoides* (Desm.).
7. *N. armatus* I. Geoff. = *Mus. hispidus* Licht., not *E. hispidus* Desm.

III. Echimys.

8. *E. setosus* Desm.
9. *E. cayennensis* Desm.
10. *E. myosurus* (Licht.) = *Loncheres longicaudatus* Rengg.
11. *E. albispinus*, sp. nov.
12. *E. spinosus* Desm.
13. *E. hispidus* Desm.

Of the generic distinctness of *Dactylomys* there is of course no question, and it can be set aside without further consideration as being in no way involved with *Echimys*, *Loncheres*, or *Nelomys*. Respecting *Nelomys*, he says: "J'ai trouvé que l'*Echimys cristatus* et le *Nelomys blainvillii* sont bien, comme l'a avancé M. Jourdan et comme l'a admis M. Frédéric Cuvier, deux espèces parfaitement congénères." Consequently *Nelomys* (type *N. blainvillii*) Jourdan is a pure synonym of *Loncheres*, which, on the principle of elimination, has *E. cristatus* as its type.

Respecting *Echimys*, I. Geoffroy says: "Ce genre, appelé *Loncheres* par Illiger, comprenait, avec les espèces qui s'y trouvent conservées, celles qui sont présentement séparées sous les

[1] The authority for *Echimys*, and for all the species here assigned to Desmarest, is given as "Geoff. St.-Hilaire" (= E. Geoff. St.-Hilaire), from their having been first named by his father, although admittedly not published by him, but by Desmarest.

noms générique de Dactylomys et de Nélomys (*l. c.*, p. 51). He here restricts the name *Echimys* "aux espèces analogues par leur organization à l' *Echimys setosus*" (*l. c.*, p. 30). As, however, the type of *Echimys* should be one of the two species originally referred to it, the type is properly *E. spinosus* Desm., unfortunately a species not strictly congeneric with *E. setosus* Desm., now referred to the genus *Mesomys* Wagner (1845).

Mesomys was originally based[1] on a tailless specimen from Borba, Brazil, which was also the basis of the type species, *Mesomys ecaudatus* (sp. nov. ex Natterer MS.). The genus is here characterized as follows: "Habitus Loncherium, dentes Echinomyum, spinæ validæ, cauda nulla"; and he adds: "Die einzige mir bekannte Art ist *Mesomys ecaudatus* Natt." Quoting later from Natterer's manuscript notes, he says the specimen was a pregnant female, and though the young were still very small, they had short tails.[2] This shows that the tailless condition of the type of *Mesomys*, was only the frequent abnormality common to the various species of South American Spiny Rats.[3] Winge and Trouessart associate with this species *E. spinosus* Desm., as well as certain other species, but I find no satisfactory account of the dentition of *M. ecaudatus*. In any case, the type of *Echimys* is *E. spinosus* Desm. Therefore the large group of species now currently referred to *Echimys*, namely the *E. cayennensis* group, is still in need of a name, since *Dactylomys* I. Geoffroy (1838), *Isothrix* Wagner (1845), *Lasiuromys* Deville (1852), *Thrinacodus* Günther (1879), *Thricomys* Trouessart (1880), and *Kannabateomys* Jentink (1891), are all so different from the present group as not to require consideration in this connection. *Nelomys* Jourdan (1837) and *Phyllomys* Lund (1841) are both, apparently, synonyms of *Loncheres*.

The foregoing may be summarized as follows:—

1. The name *Echimys* was given to a genus of mammals by Étienne Geoffroy Saint-Hilaire in 1808 or 1809, in a work still unpublished.

2. *Echimys* as the name for a genus of mammals was first published by F. Cuvier in 1809, from a manuscript work by E.

[1] Arch. f. Naturg., 1845, i, 145.
[2] Abhandl. der II Cl. d. k. Akad. d. Wiss. München, V, Abthl. 2, 1848, 295.
[3] On this condition in *Echimys trinitatis* see Allen and Chapman, Bull. Am. Mus. Nat. Hist., V, 1893, 226.

Geoffroy Saint-Hilaire, and was exclusively based on (1) "le Lérot à queue dorée" of Allemand (in Buffon), named *Myoxus chrysurus* by Zimmermann in 1780, and *Echimys cristatus* by Desmarest (ex E. Geoffroy, MSS.) in 1817; and (2) le "Rat épineux" of Azara, named *Echimys spinosus* by Desmarest in 1817 (ex E. Geoffroy MS.).

3. In 1812 F. Cuvier further characterized the genus *Echimys*, from the same two species above named.

4. Therefore one of these two species, as they are not congeneric, must be taken as the type of *Echimys*.

5. Illiger, in 1811, established the genus *Loncheres*, referring to it two species, namely, (1) *L. paleacea*, a species not described till nine years later, and (2) "*Hystrix chrysuros* LinGmel.,"= *Myoxus chrysurus* Zimm.

6. As an undescribed species cannot be taken as the type of a genus, *Myoxus chrysurus* Zimm. (= *Echimys cristatus* Zimm.) becomes the type of *Loncheres*.

7. This, by the process of elimination, leaves *Echimys spinosus* Desm. as the type of *Echimys*.

8. *Nelomys* Jourdan (1837), based on a species (*Nelomys blainvillii* Jourd.) currently recognized as congeneric with *Echimys cristatus* Desm. (= *Myoxus chrysurus* Zimm.), is therefore a pure synonym of *Loncheres*.

9. *Mesomys* Wagner (1845) was based on a species (*Mesomys ecaudatus* Wagner) currently treated as congeneric with *E. spinosus* Desm., and is therefore in all probability a pure synonym of *Echimys*. If otherwise (I am unable to find a satisfactory account of the dentition of *Mesomys*), *Mesomys* will not conflict with *Echimys*.

10. In 1817 Desmarest described the following seven species under *Echimys*, adopting therefor E. Geoffroy Saint-Hilaire's manuscript names. These species are:

1. Echimys cristatus.
2. Echimys dactylinus.
3. Echimys spinosus.
4. Echimys hispidus.
5. Echimys didelphoides.
6. Echimys cayennensis.
7. Echimys setosus.

11. The subsequent history of these species, in relation to the genus *Echimys*, is as follows:

a. In 1811 *Echimys cristatus* became the type of *Loncheres* Illiger.

b. In 1838 *Echimys dactylinus* became the type of *Dactylomys* I. Geoffroy Saint-Hilaire.

c. Echimys spinosus was referred by Burmeister in 1854[1] to the genus *Mesomys* Wagner, who assumed (with Reinhardt, but doubtless incorrectly) that *Mesomys ecaudatus*, the type of *Mesomys*, was based on simply a tailless specimen of *E. spinosus.*

d. Echimys cristatus and *E. didelphoides* are still currently referred to *Loncheres.*

e. The remaining three species, *Echimys hispidus*, *E. cayennensis*, and *E. setosus*, are still referred to the genus *Echimys*, as the genus is now currently accepted.

12. The genus *Echimys*, as now currently accepted, is not the true *Echimys* of F. Cuvier, but *Echimys* as emended by I. Geoffroy Saint-Hilaire in 1838 and 1840, by improperly taking *E. setosus*, instead of *E. spinosus*, as the type.

13. For the group of species now commonly referred to *Echimys* no name hitherto proposed is available.

In view of the foregoing it seems necessary to provide a name for the group containing *Echimys cayennensis*, *E. hispidus*, and *E. setosus* of Desmarest (1817, ex E. Geoffroy Saint-Hilaire), and the allied species since described, for which I here propose

Proëchimys, gen. nov.

Echimys I. Geoffroy Saint-Hilaire, Ann. des Sci. Nat. sér. 2, X, 1838, 125; Mag. de Zool., sér. 2, 1840, 30. Not *Echimys* of F. Cuvier, 1809, ex I. Geoffroy Saint-Hilaire, MS.

Type, *Echimys trinitatis* Allen and Chapman.

The following, besides other species, seem probably referable to *Proëchimys*:

1. Proëchimys cayennensis (*Desm.*).
2. " hispidus (*Desm.*).
3. " setosus (*Desm.*).
4. " albispinus (*I. Geoff.*).
5. " dimidiatus (*Günther*).
6. " ferrugineus (*Günther*).
7. " semispinosus (*Tomes*).
8. " centralis (*Thomas*).
9. Proëchimys chrysæolus (*Thomas*).
10. " decumanus (*Thomas*).
11. " gymnurus (*Thomas*).
12. " trinitatis (*A. & C.*).
13. " canicollis (*Allen*).
14. " urichi (*Allen*).
15. " mincæ (*Allen*).
16. " cherriei (*Thomas*).

[1] Thiere Brasiliens, I, 1854, 205.

Article XXI. — THE ESKIMO OF SMITH SOUND.

By A. L. Kroeber.

The following pages consist in the main of the results of investigations carried on in the winter of 1897–98, under the direction of Dr. F. Boas, among six Eskimo from Smith Sound, brought to New York by Lieut. R. E. Peary. Lieut. Peary also secured for the Museum an ethnological collection. This is described in the present article, and from it the illustrations are taken. To this description have been added references made to the tribe by various Arctic explorers, especially Lieut. Peary. The material thus obtained has been illustrated whenever possible by comparisons with that from other Eskimo tribes.

The following works are referred to :

John Ross. A Voyage of Discovery . . . for the Purpose of Exploring Baffin's Bay, and Inquiring into the Probability of a North-West Passage. London, 1819. [Cited, Ross.]

Emil Bessels. Die Amerikanische Nordpol-Expedition. Leipzig, 1879. [Cited, Bessels.]

H. Rink. The Eskimo Tribes, their Distribution and Characteristics, especially in Regard to Language (Meddelelser om Grønland, Vol. XI and supplement). Copenhagen. Vol. I, 1887 ; Vol. II, 1891. [Cited, Rink, *Eskimo Tribes*.]

G. Holm. Ethnologisk Skizze af Angmagsalikerne. [Cited, Holm, *Ethnologisk Skizze*.]

G. Holm. Sagn og Fortaellinger fra Angmagsalik. [Cited, Holm, *Sagn*.]

H. Rink. Tales and Traditions of the Eskimo. [Cited, Rink, *T. and T.*]

David Cranz. Historie von Groenland. 1765. [Cited, Cranz.]

F. Boas. The Central Eskimo (Sixth Annual Report of the Bureau of Ethnology). [Cited, Boas.]

L. M. Turner. Ethnology of the Ungava District, Hudson Bay Territory (Eleventh Annual Report of the Bureau of Ethnology). [Cited, Turner.]

I. Hayes. Open Polar Sea. 1867. [Cited, Hayes.]

E. K. Kane. The Second Grinnell Expedition, in Search of Sir John Franklin. 1856. [Cited, Kane. References are to the *second* volume.]

R. E. Peary. Northward over the Great Ice. 1898. [Cited, Peary. References are to the *first* volume.]

Mrs. J. Peary. My Arctic Journal. 1893. [Cited, Mrs. Peary.]

E. PETITOT. Vocabulaire français-esquimau. 1876. [Cited, PETITOT.]
Résumé des communications sur le Grønland (Meddelelser om Grønland, X). [Cited *Résumé*.]
K. TH. PREUSS. Die Ethnographische Veränderung der Eskimo des Smith Sundes (Ethnol. Notizblatt, II, 1, p. 38).

When Greenland or the Greenland Eskimo are mentioned in the following pages, the Eskimo of the West Coast, who are now under Danish government, are meant. Angmagsalik, or East Greenland, is that portion of the East Coast inhabited by the independent tribe called Angmagsalingmiut, our knowledge of whom is recent, and due altogether to Holm. The term 'Central Eskimo' is employed as by Boas, Rink, and others, and includes the tribes of Baffin Land, Melville Peninsula, Boothia, and the adjacent coasts and islands.

The Smith Sound tribe of Eskimo (Ross's Arctic Highlanders) inhabit the shores of northwestern Greenland, south of and along Smith Sound. Their southernmost habitation is in the group of islands off Cape York (about lat. 76°); the most northerly is Ita (lat. 78° 18′). When hunting, they occasionally pass beyond these limits; and finds of implements and house-ruins indicate that in the past they inhabited the coast at least as far north as lat. 81° 36′ (BESSELS, pp. 136, 251). Discovered by Sir John Ross in 1818, the Smith Sound Eskimo have since been visited by Franklin, Kane, Hayes, Hall, and Peary, as well as by whalers. So isolated are they, that, excepting these intermittent visits from whites, they have practically no communication with, or knowledge of, any part of the rest of the world. Melville Bay, whose shores seem uninhabitable, cuts them off from the Greenlanders, so that there is absolutely no intercourse between the two districts, nor any record of any intercourse. In fact, Ross states (p. 84) that they refused to believe that he came from the south, saying that there was nothing but ice there. Hayes (p. 385), it is true, was told by a Smith Sound native that his people had once inhabited the coast 'continuously,' but had been cut off on both sides by accumulating ice; but this statement, even if accurate, was made after the Smith Sound Eskimo had, through the Arctic explorers, met several Greenland Eskimo. Only with the tribe of the Central Eskimo inhabiting the east coast of

Ellesmere Land has there been any intercourse in recent years. Bessels (p. 342) states that Itokirssuk, born near Cape Searle in Baffin Land, travelled north with his father to Ellesmere Land, where he married. About 1868 he crossed Smith Sound, accompanied by an umiak and four kayaks. Landing at Littleton Island, they proceeded to Ita. The rest of the party returned the same summer, but Itokirssuk and his family remained. Peary (p. 406) says that Koodlak, father of Eetookashoo (Itukassuk), killed a native at Peterahwik years ago ; also (p. 488) that twice within the memory of living individuals there have been accessions from the western tribes. Each of these migrations consisted of one or two families. One of the men came from Dexterity Harbor, *via* Ellesmere Land. In his census of the tribe, Peary mentions three men and three women who had come from the west coast of Smith Sound. One of the men is named Komonahpik. I learned that about 1868 Qumunapik, a shaman, came from Ellesmere Land with his wife, mother, and uncle. He is said to have come without knowing of the existence of the Smith Sound tribe. He crossed the sound in winter on a sledge, carrying a tent, and then followed the coast south to Ita.

It is evident that these various accounts refer to only one or two incidents. Itokirssuk and Qumunapik seem to be the same man with a changed name ; and this surmise is confirmed by the names of his relatives, as given by Bessels and Mrs. Peary, and as obtained by myself. It is clear that the intercourse across Smith Sound was very slight ; and that it must have ceased for a long period previous to these recent cases, is shown by the fact that the Smith Sound Eskimo had time to forget the construction or use of the kayak and of the bow, though they remembered these implements traditionally, and, since the accessions from the west, again use them generally. Any intercourse of the tribe with more remote tribes is of course out of the question.

The Smith Sound Eskimo call these western people 'Adlet.' (Among the Central Eskimo the Adlet are a fabulous race, half man and half dog, descendants of a woman who mated with a dog. In Labrador 'alla' signifies an Indian.) The Adlet are feared at Smith Sound, on account of their supposed bloodthirsty disposition. They evidently do not differ much from the Eskimo of Baffin Land, as the points in which they differ ethnologically

from the Smith Sound Eskimo are all cases of agreement with the Baffin Land tribes. These respects are: the exchanging of wives; the fact that the women tattoo their faces; the employment of the same personal names for both sexes, while Smith Sound men's names differ from women's; the use of reindeer-skin for the drum, while at Smith Sound seal-intestine is employed; and the use of a tent (qanissä'ling) resting upon several poles in place of the three that support it at Smith Sound. In language, too, the Adlet are said to differ from the Smith Sound tribe. When Qumunapik first arrived at Smith Sound, he needed signs to make himself understood. Instead of 'nă'ga,' he said 'hā'ka' or 'hāqa' for 'no' (Baffin Land, 'aqai').

The number of the Smith Sound tribe — estimated by Kane at 150, Hayes at 100, Bessels at 110 — was first determined by a complete census, taken by a member of Peary's expedition in 1895. There were then 253 persons in the tribe. In 1896, owing to an epidemic, these had been reduced to 229, but in 1897 had risen to 234. Kane (II., p. 109) and Hayes (p. 386) were under the impression that the tribe was fast dying out, and stated this to be the opinion of the natives themselves. Even Peary, who was better able to judge, and who considers the population stationary though subject to fluctuations, says (p. 490) that they have a tradition that the tribe was formerly more numerous. According to the census, the number of males was 140, of females 113; that is, only about 81 females to 100 males. In all other regions of Greenland the women constantly outnumber the men. In Angmagsalik, in southern East Greenland, and in the four districts of West Greenland, the proportions were respectively 114, 160, 119, 113, 108, 112 women to 100 men. In Baffin Land the proportional number of women is 104.

The Smith Sound Eskimo make their settlements at certain places, but never form permanent villages. The same house is rarely occupied by the same family in two consecutive years (Peary, p. 272). Certain spots are visited and inhabited only at certain times of the year. In summer the tribe seems to be more or less scattered, and there is little intercommunication. In winter, scarcity of food often causes changes of habitation. In spring there is a great gathering at Pituarvik for the walrus-hunt, which sometimes lasts three months. In 1894 more than

two-thirds of the tribe were gathered here in more than forty snow-houses (PEARY, p. 430). Among the most frequently and densely inhabited places are Ita or Igita (the northernmost habitation in the world), Pituarvik, Natilivik, Imnangana (Cape York), Akpan (Saunders Island), and Kiätang (on Northumberland Island). The whole country is called merely 'nuna' ('land').

Owing to the absence of any boats but kayaks, and the superior facility of travelling with sledges, winter is the time chosen for visiting. The sledge routes generally follow the coast, but sometimes go inland, especially over peninsulas, or between the heads of fjords or bays, in order to avoid détours. Kane states that the entire distance from Cape York to Igita can be traversed in four days; the stages being Cape York to Akpan, to Natilivik, to Karsioot (?), to Igita. Ordinarily, however, each of these stages is made in two days.

The food of the Smith Sound Eskimo is altogether animal. Only the women, in summer, at times collect a species of small flower, which they cook; but the men do not eat this; the women, however, are forbidden to eat eggs (Mrs. PEARY). The principal staple is seal, though walrus is almost as important as a food-supply (PEARY). Narwhal is also successfully hunted. Fish do not seem to be caught or eaten much, and of shell-fish only those that are found inside the walrus. Bear and fox are eaten, but not the hare. Seals are stacked in piles, and cached for winter use; but famine nevertheless occurs.

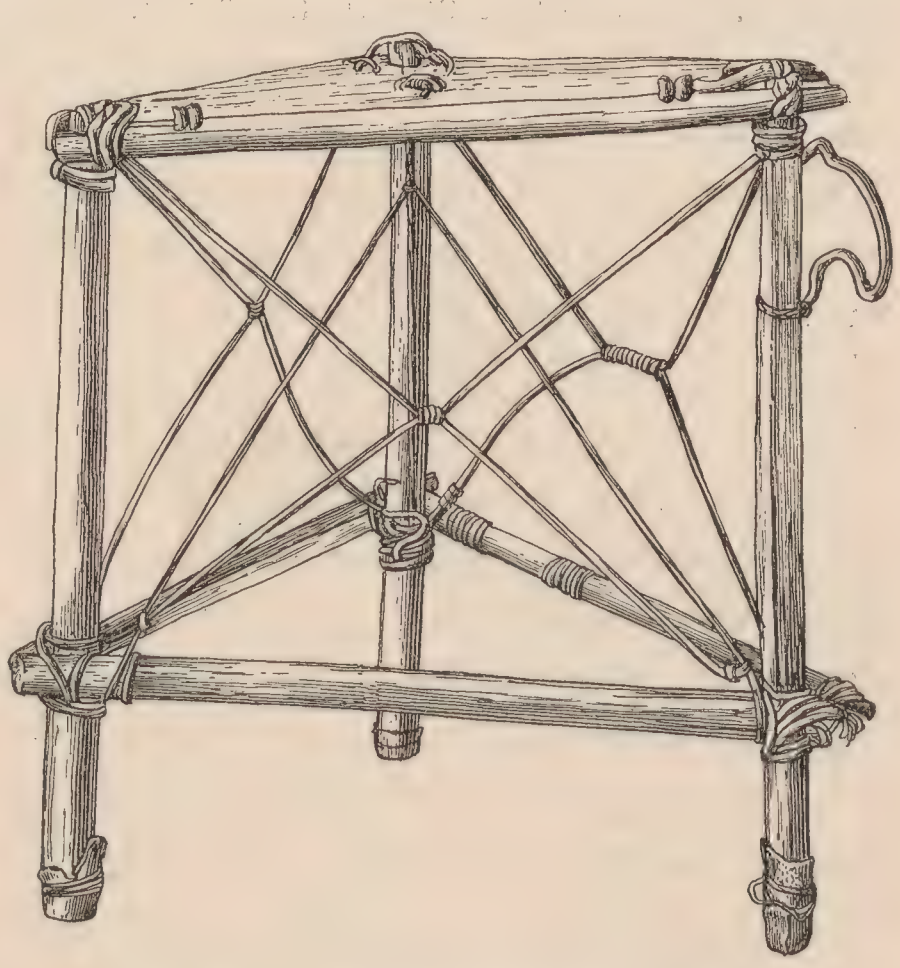


Fig. 1 ($\frac{60}{10881}$). Seal-hunter's Stool. $\frac{1}{8}$ nat. size

In summer, seals are hunted from the kayak with harpoon, line, and floating bladder. In winter and spring they are speared

through their breathing-holes. The hunter sits on a three-legged stool (Fig. 1) covered with bear-skin below to prevent its sliding or making a noise, which would frighten away the animal. Seals are also hunted on the ice, the hunter crawling up on his stomach, and imitating the cry or breath of the seal: 'Bāx! bāx!' Then he springs up and stabs it. The large ugssuk ('ground-seal,' *Phoca barbata*) and the walrus are hunted from the edge of the ice. For the walrus-hunt the harpoon-line has a loop at the end, through which the turuk, or end of the spear, is stuck into the ice to hold the animal. When a party secures a seal, all the members obtain a share; but the actual killer gets the head (and of course the skin).

The polar bear is considerably hunted. He is pursued on sledges; and the dogs are successively let loose until he is brought to bay by them. The reindeer is now generally hunted with guns. Wolves have also occasionally been shot; but the musk-ox seems to inhabit only the region to the north. Of birds, great numbers of small auks are caught with nets at the end of a handle. Gulls are eaten, as is the breast of the raven, which is caught with snares. Fish are speared, through holes cut in the ice, with the kakivang. The narwhal, in summer, is hunted from the kayak; in winter, in the cracks in the ice. In former times, when there were still many kayaks, the tradition goes that whales were hunted. No floating bladder was necessary for this, as the whale, when killed, did not sink. Now, however, the whales are not pursued, as there are not enough kayaks.

The dwellings of the Smith Sound Eskimo are of three sorts,—the house built of stone and sod (iglu, qarmang, or qangma), the snow-house (igluija), and the tent of skins (tupeq). Peary also calls a house with stone walls and a skin roof 'kangmak.' The stone house is more or less irregular in shape. It is about twice as long as wide; the bed taking up the rear two-thirds of the length, and the entire breadth. Flanking the open space at its foot are two alcoves (iglaxsung) raised above the floor to the level of the bed. When the family is large, one or two persons sleep in these alcoves. At other times, meat, when it is not lying in the middle of the floor, is kept in them. These small side-extensions give the house a more or less pear-shaped outline. A house measured by Peary (p. 270) was ten feet long, by eight

feet wide through the alcoves, but less than five feet wide at the end opposite the door. He illustrates a more extreme form on p. 108. The bed is made of grass covered with skins. The door (katang) is only about a foot and a half high. The entrance-passage or tunnel (torxssu) is straight and single. Frequently two houses have but one entrance, and are then known as 'qarearing.' New houses do not seem to be built, or, if so, the materials of existing ones are used. There is no ownership of houses: they belong to the community. In summer, when they are deserted, they are unroofed, says Peary (p. 272). This entails the heavy task of re-roofing in autumn. The roof consists of flat slabs, which have sometimes to be carried considerable distances.

The average diameter of snow-houses, which are generally constructed for temporary shelter only in time of travel, is about twelve feet; the height, half of that. At Pituarvik, however, at the spring walrus-hunt, the snow-houses are sometimes occupied for several months, and are carefully constructed. One of these is described by Peary (p. 427). In shape it was semi-elliptical, measuring twelve feet by twelve feet, and seven feet in height. The bed was six feet and a half long, and a foot and a half above the level of the floor. The floor-space was five feet deep, but only six feet wide, as on each side of it was a ledge holding a lamp and meat, corresponding to the alcove of the stone house. The entrance consisted of two vaults connected by a short passage. The window of seal-intestine, about two feet square, was immediately above the door. Inside, the walls were lined with tent-skins. Above was a ventilation-hole. The second of the two entrance-vaults was flanked by two alcoves, or storerooms. Fig. 2 shows a model of the snow-knife which is used to cut the blocks of snow.

Fig. 2 ($\frac{60}{937}$). Model of Snow-knife.

The tupeq, or skin tent, is inhabited in summer. It rests on a frame of three poles. Two of these, which are nearly upright, are parallel, or almost so, and connected above by a shorter cross-bar. On this rests a longer pole, which projects considerably

beyond the cross-bar. The entrance seems to be between the two parallel sticks. The tents of the Adlet (inhabitants of Ellesmere Land) have, instead of these two poles, a number so arranged as to form half the surface of a cone. Formerly whale-jaws and narwhal-tusks were used for tent-poles; now the Europeans have brought wood. The edges of the tent are held down by large rocks.

None of the Arctic explorers at Smith Sound saw any kayaks or skin boats, excepting the most recent, Peary. The art of building them had apparently been forgotten, though the word 'kayak' remained in the language. Under normal conditions, Smith Sound seems to be free from driftwood, while the temperature prevents the growth of even stunted timber: consequently the natives, when first discovered, were altogether without wood. This lack of wood would account for the absence of kayaks. But from the time of Ross (1818) every visit has supplied the Eskimo with this material, not to mention the wreck of more than one vessel; and yet as late as 1873 no kayaks had been built. It is clear that the art had been forgotten, and the supply of wood alone could not restore it. The accession of the Adlet (Ellesmere Land Eskimo) was necessary before kayaks could again be made.

The frame of the Smith Sound kayak (Figs. 3, 4) has five longitudinal pieces. The upper two are the gunwales, the lower three the bottom. The cross-pieces on the top, bottom, and sides (corresponding to ribs), number about twenty. The kayak is markedly flat-bottomed, and rather low, especially at the stern. Towards the bow, however, the gunwale gradually rises higher above the bottom; and the three lower lengths of the frame meet in a point several feet from the extreme bow. The middle length or keel alone extends farther, and then rises at an angle to the gunwales as they meet forward. This gives a very sharp bow, in spite of the flat bottom. The opening in which the rower sits is back of the middle; and the greatest width is back of this seat. This kayak is a copy of the typical kayak of the Central Eskimo, of whom the Ellesmere Land tribe, who reintroduced the kayak at Smith Sound, are part. The kayak of Baffin Land, for instance, is more slender and less clumsy than that built at Smith Sound; thus the bow is cut away more below,

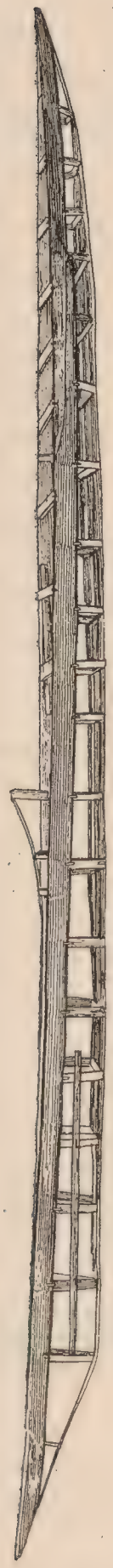


Fig. 3 ($\frac{60}{460}$). Framework of Kayak. Length, 18 ft. 6 in.

Fig. 4 ($\frac{60}{1095}$). Kayak. Length, 18 ft.

Fig. 5 ($\frac{60}{388}$). Paddle. Length, 8 ft. 8 in.

giving a more gradual and greater overhang; but it is clearly made after the same pattern, since it possesses even the same details of design, such as the small, blunt, sudden curve upward at the stern. The Greenland kayak, however, is very different in appearance. The keel is generally lower than the other longitudinal pieces, so that the bottom is not flat. Both ends curl upward considerably, first flattening and then curving to a sharp point. The bow is protected by a strip of bone.—The paddle (Fig. 5) is made entirely of wood. The blades are often made of pieces of wood lashed together. Each handle consists of a long notch for the fingers on the upper side of the paddle and a small notch for the thumb on the lower side.

The larger open boat (umiak, woman's boat) of other regions, the Smith Sound Eskimo do not possess at all. Only one of the Ellesmere Land immigrants is said to have, or have had, a small umiak.

Sledges were formerly made altogether of bone and ivory, pieces of which were ingeniously lashed together to form the long runners. A good illustration of this bone sledge is given by Ross. Now wood is used, only the lower edge of the runner being covered with flattened pieces of bone or ivory. Ross also illustrates the form of whip originally in use. Fig. 6 is a model of the present form of whip. Fig. 7 represents the implement used to attach the dog-traces to the sledge. The trace of the dog's harness is passed through the smaller hole, while through the larger hole passes the heavy transverse line on which all the traces are strung. The ends of this stronger line are fastened to the sledge-runners, but in the middle it is broken, to permit the insertion of the eyes holding the traces. When the eyes are inserted, the line is joined again by means of a loop passing over the button shown in the illustration (Fig. 8). A tool-pouch (Fig. 9) is generally carried fastened to the back of the sledge.

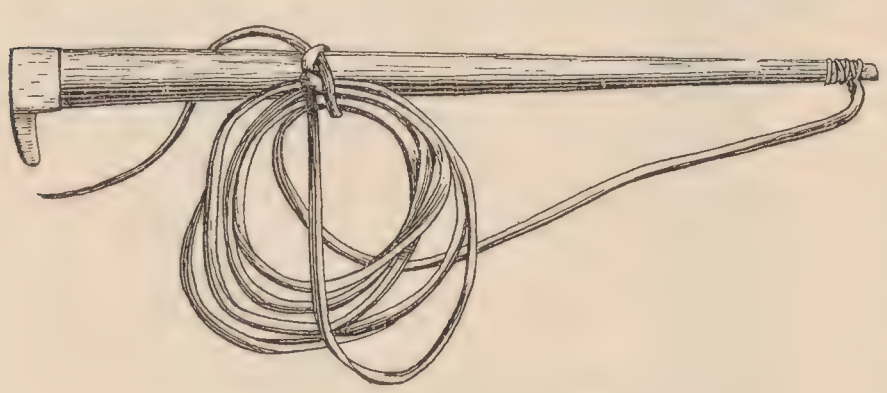


Fig. 6 ($\frac{60}{234}$). Model of Whip.

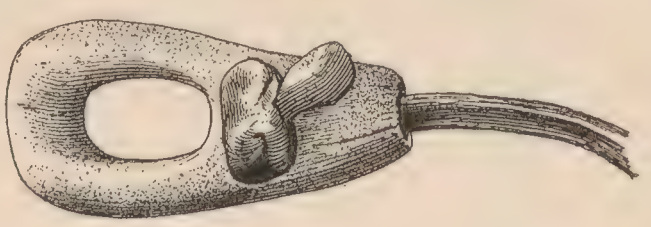


Fig. 7 ($\frac{60}{294}$). 'Eye' for fastening Traces to Sledge. $\frac{1}{2}$ nat. size.

The Smith Sound Eskimo, although possessing guns, continue to use the bow. In fact, it is but a comparatively short time since they have employed it at all. Mention of it is made in their tales, so that, like the kayak, it was clearly not altogether forgotten; but the earlier visitors found them without it. In 1873 the Adlak Itokirssuk was the only member of the tribe possessing a bow, says Bessels (p. 360). This was made of four pieces of caribou-antler, backed by four strands of sinew, and was 33

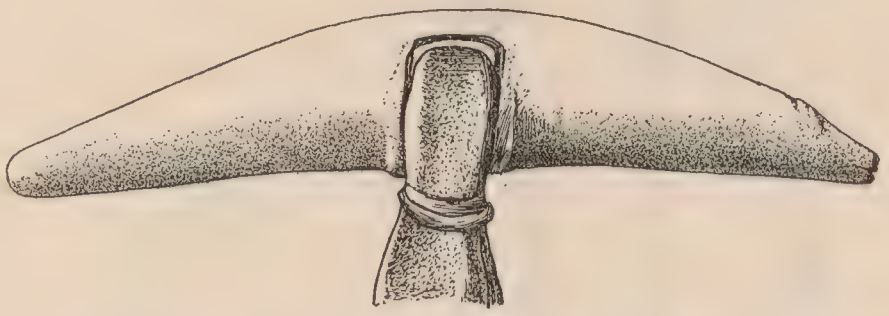


Fig. 8 ($\frac{60}{293}$). Button for fastening Traces to Sledge. $\frac{1}{2}$ nat. size.

Fig. 9 ($\frac{60}{285}$). Tool-pouch. $\frac{1}{5}$ nat. size.

inches long. Through this man, bows were probably re-introduced. Those now in use (Fig. 10, *a*) consist of three pieces of bone or antler, forming a double curve. The three pieces are cut off square, and joined end to end. Each joint is made by two smaller pieces of bone or ivory, which are wound with sinew. Of these, the piece on the inside of the bow is short and rather thick; the one on the outer, convex side is flat, long, and

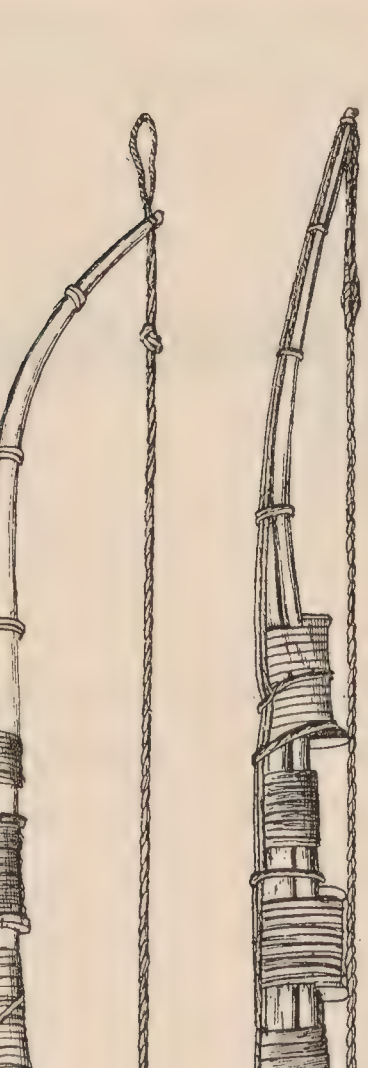


Fig. 10.

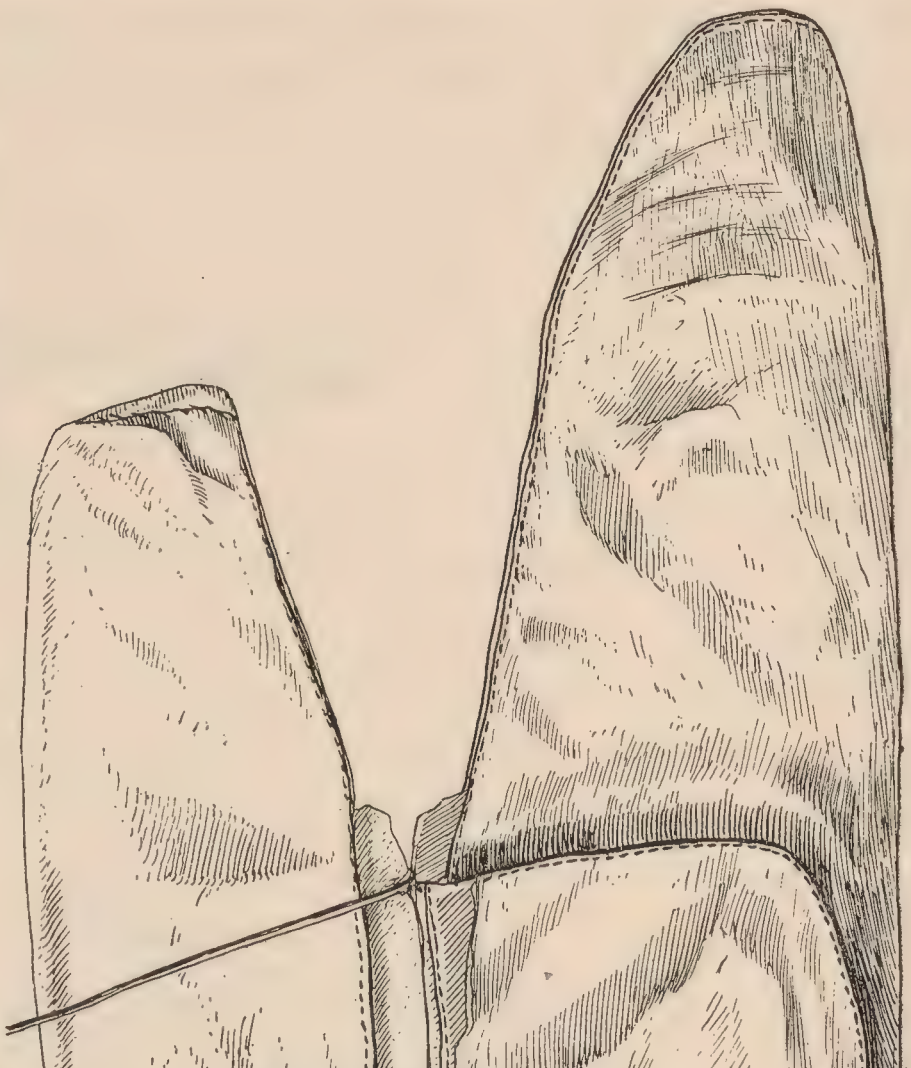


Fig. 11.

Fig. 10, *a* ($\frac{60}{278}$), *b* ($\frac{60}{281}$). Bows. Length, 34 and 38 inches.
Fig. 11 ($\frac{60}{275}$). Quiver. Length, 31 inches.

thins to an edge at both its ends. One specimen in the American Museum of Natural History (Fig. 10, *b*) consists of four main pieces, and thus has three joints. The bows are strengthened by from eight to ten strands of sinew along the back. The length is about three feet, and the curvature slight. The arrows (Fig. 12, *a*) consist of a rather blunt lance-shaped iron head from four to six inches in length, inserted in an unfeathered wooden shaft. Some arrows have foreshafts made of bone, which are bevelled off at the lower part, and tied to the end of the wooden shaft (Fig. 12, *b*). This method of attachment of foreshaft is characteristic of the Central tribes (Boas, p. 505). The sealskin quiver (Fig. 11) consists of two compartments, the larger for the bow. The two compartments are joined along the edge, and can be folded together lengthwise, one upon the other. The ends of both bow and arrows project from their respective compartments, although in some cases there is a cap fitting over the end of the smaller compartment to cover the arrows. Sometimes there is a small square pouch on the side of the quiver, which is covered between the two parts of the quiver when it is folded together, the opening of the pouch being along the 'hinge.'

In Greenland, bows were very early displaced by guns; they seem to have been made of wood, and to have measured a fathom in length (Cranz, p. 194). The bow in use at Cumberland Sound in Baffin Land is described by Boas (p. 503) as consisting of three pieces of antler, the middle one, obtusely triangular in shape, serving merely to connect the other two. This arrangement differs very much from that made use of at Smith Sound. On the other hand, bows from Pelly Bay and Victoria Land are described as consisting of three pieces of antler, the joints being made as at Smith Sound, with the difference that the longer and flat splint piece is inside, the shorter one outside. The quiver in use at Cumberland Sound is similar to that of Smith Sound. At Iglulik (Fury and Hecla Strait), however, a quiver is made that does not fold together, but has the form of a long, irregularly-shaped sack.

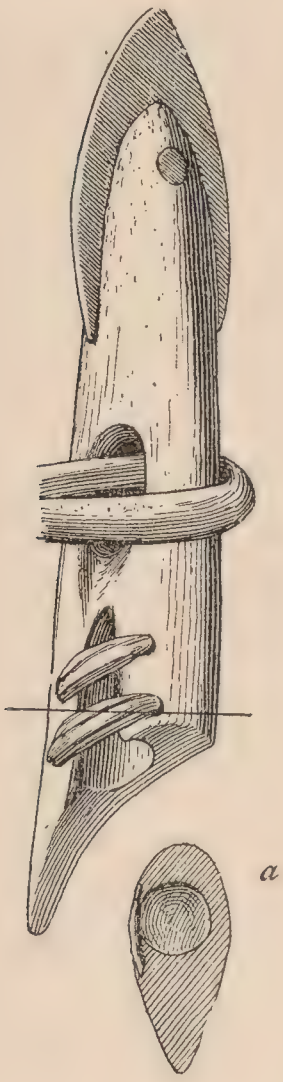
Fig. 12, *a* ($\frac{60}{279}$), *b* ($\frac{60}{633}$). Arrows. $\frac{1}{4}$ nat. size.

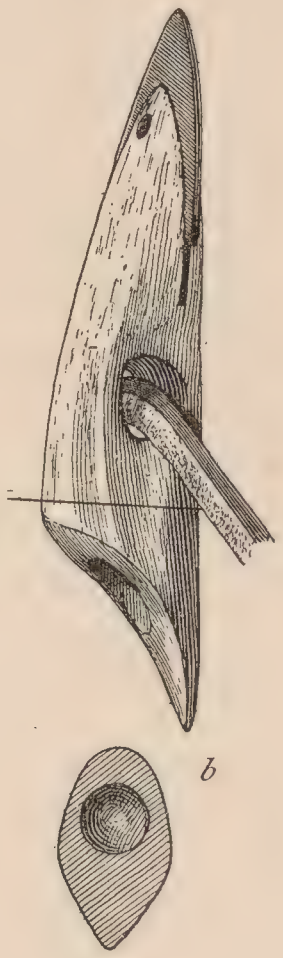
The remaining hunting implements of the Smith Sound Eskimo, which are used chiefly in the chase of sea-animals, are the harpoon and the lance. These often resemble each other, but can always be distinguished by the fact that the harpoon has a head which remains fixed in the body of the animal, while it separates from the shaft but is attached to a long line. The lance, on the other hand, has an unbarbed point, that may be movable, but not detachable; and it is used without a line. The harpoon serves to secure the animal, the lance to despatch it.

The ordinary harpoon is the unang (Plate XI, Fig. 1). The shaft of this may now be of wood. Formerly it consisted of a narwhal-tusk. The heavier butt-end of this tusk is thinned down by being flattened on two sides or cut away all around. The hollow in this end is filled with wood or moss. From the butt a thong extends forward about a foot, forming a loop along the shaft. Between this thong and the shaft passes the hunting-line (agluna) attached to the head; so that the ivory shaft, though not directly fastened to either the head or the line, is prevented by the latter from sinking. When the main body of the shaft is of wood, the point of a narwhal-tusk forms the tip of the shaft; the tusk and the wood being mortised, and wound with thong. The head of the unang will be described below.

The igimang (Plate XI, Fig. 2) differs from the unang in that its shaft consists of two movable pieces, connected by a ball-and-socket joint, the object of the arrangement being to secure greater flexibility. The fore-joint (igimang, in the narrower sense) is a straight piece of tusk that fits into an ivory socket at the end of the main shaft of wood. Two thongs pass through it and the shaft, and hold it in place. As the socket is shallow and rounded oblong rather than circular in shape, the ivory foreshaft is easily dislocated by lateral pressure such as is exerted by the struggles of a wounded animal; but it does not become detached, as does the harpoon-head.

Of these two forms of the harpoon, only the latter is known in Greenland. The main shaft is there called 'unâq;' the foreshaft, 'igimaq;' the whole harpoon, by either of these terms, or formerly (CRANZ) 'erneinek.' In East Greenland, too, this is the form of harpoon in use; and in both places it is thrown by means of the throwing-stick, which is never employed at Smith Sound. Among the Central tribes both the smaller single-jointed and the





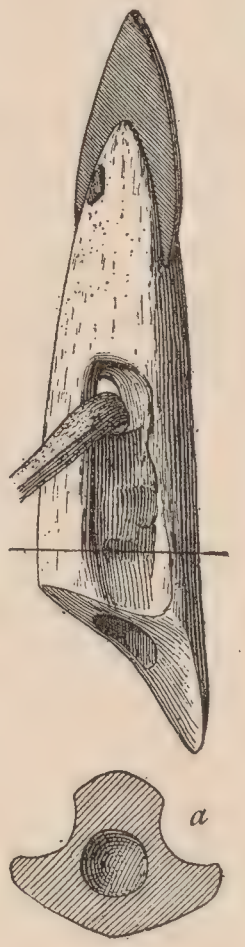


Fig. 13. Fig. 15.

Fig. 13 ($\frac{60}{134}$, $\frac{60}{157}$). Single-barbed Harpoon-heads for hunting Seal and Walrus (ssako). $\frac{1}{2}$ nat. size. *a*, *b*, Cross-sections.
Fig. 15 ($\frac{60}{325}$). Single-barbed Flat Harpoon-head. $\frac{1}{2}$ nat. size. *a*, Cross-section.

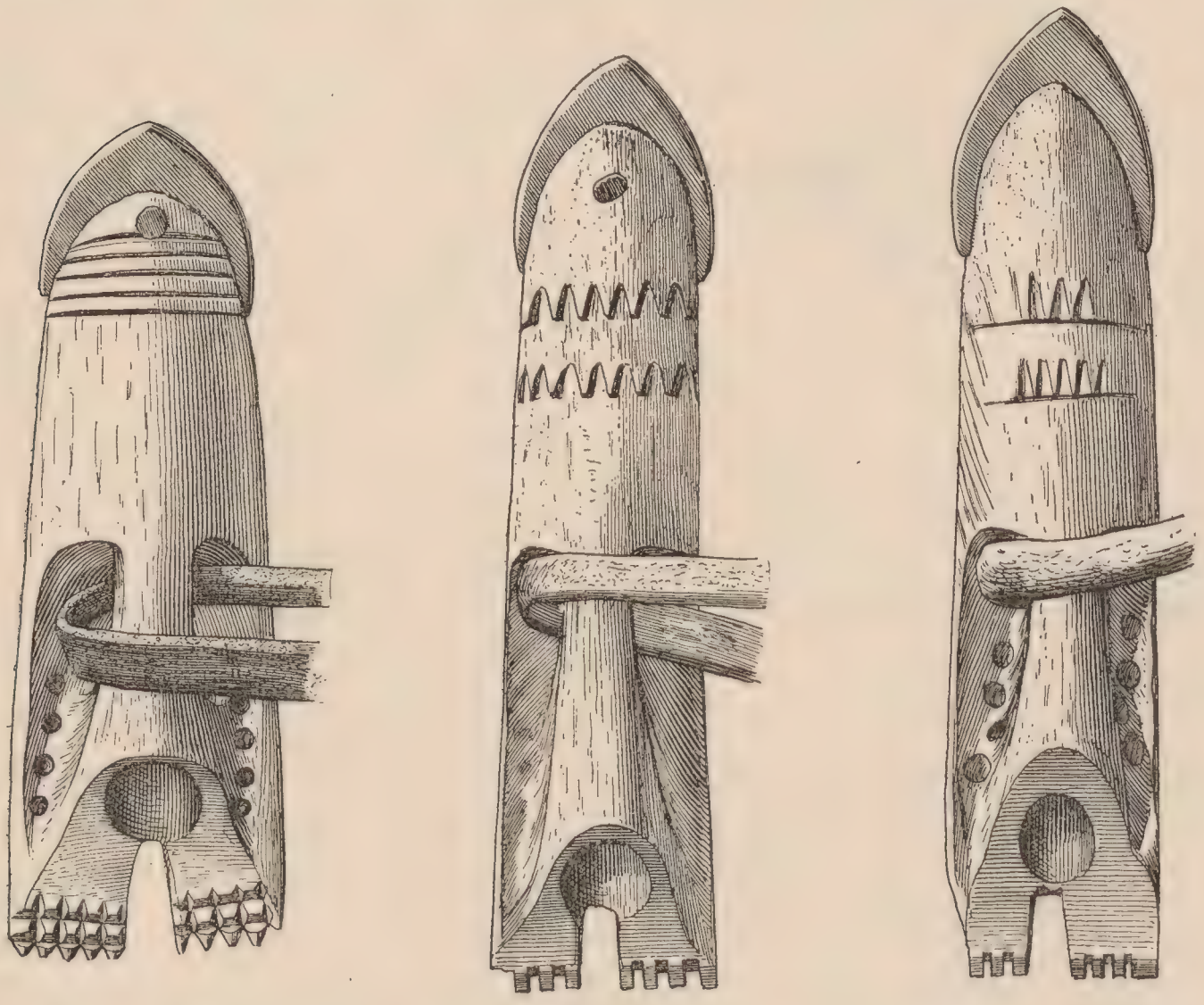


Fig. 14 ($\frac{60}{198}$, $\frac{60}{199}$, $\frac{60}{373}$). Double-barbed Harpoon-heads for hunting White Whales. $\frac{1}{2}$ nat. size.

larger double-jointed harpoon are used ; they are called ' unang ' and ' igimang ' (or ' qatilik '). In northern Baffin Land the unang is often made of a narwhal-tusk, as at Smith Sound.

The harpoon-head (Figs. 13–15), whatever its variations in form, works according to the same principle. It contains a socket which is somewhat larger than the pointed tusk at the end of the shaft, be it unang or igimang. When the head is in position, the tusk rests in this socket, so that the iron-tipped point of the ivory head is in line with the shaft and several inches in advance of it, while the rear end, or barb, lies along the tusk. Through the head passes the end of the main line or a loop fastened to the end of this line, which lies along the shaft to a point about midway its length. Here the shaft has a small ivory peg, while to the line is fastened the teliqbing (Fig. 16), a piece of ivory about two inches in length by half an inch in breadth, which contains two or three holes into which the peg just fits. The teliqbing is attached to the line in such a place that, when it covers the peg, the line forward from it is rather taut, so that the harpoon-head is held in place on the point of the foreshaft. The several holes in the teliqbing allow the line to be held taut even when its length becomes changed through wetting, etc. While the harpoon is penetrating the animal, the pressure is all longitudinal, and the head remains in position ; but the weight of the shaft and the movements of the game begin at once to exert a lateral strain, and the head and shaft become disengaged, the head being held in the animal by becoming transverse in position to the direction in which it entered. The animal is then held by the line until it is killed with the lance.

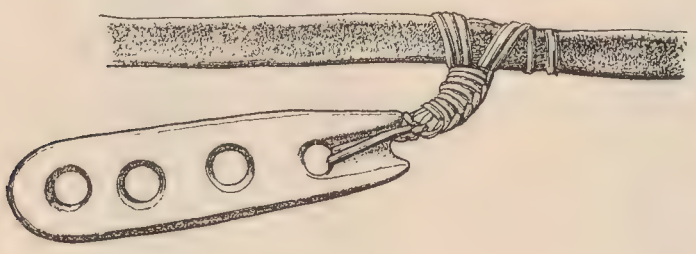


Fig. 16 ($\frac{60}{375}$). Teliqbing. $\frac{1}{2}$ nat. size.

The harpoon-head has two forms at Smith Sound. The head used for hunting seals and walrus has one rather sharp barb. The socket generally consists of a notch cut into the base of the harpoon-head from the side. The outer side of this notch is closed by means of thongs which are passed through two pairs of drill-holes (Fig. 13). For cetaceans, whose skin is soft, a sharp, pointed barb cannot be used : consequently a broader, flat head, which has two barbs terminating in blunt edges (Fig. 14), is em-

ployed. The socket of this harpoon-head consists of a hole drilled in the base of a harpoon. The face of this harpoon-head is often decorated with a number of rows of notches. The pointed form is called 'ssako;' the flat, 'tokaq.' Fig. 15 shows an unusual intermediate form.

Among the Central Eskimo the harpoon-head most in use resembles the Smith Sound tokaq; it is called 'tokang' or 'naulang,' according as it is large or small. The siatko, which is not so generally used, is like the Smith Sound ssako, with the exception that its iron point and the single barb are in the same plane instead of in two perpendicular planes. In Greenland and East Greenland the flattened, double-barbed form seems also to be in more general use; but the socket which receives the point of the igimang is between the two barbs, while at Smith Sound it is above them. Heads with two pairs of barbs, one behind the other, are also used there.

The lance (Plate XI, Fig. 3) can best be described as an igimang without the harpoon-head, but with an unbarbed iron blade at the point of the flexible foreshaft. It is called 'anguvigaq.' The end of the wooden shaft is covered with a bone or ivory cap (called 'qâteq' in Greenland), containing a flat socket. The tusk, which constitutes the foreshaft, also has a cap covering its soft centre. It is rounded to fit into the socket. The connection of the two shafts is by thongs, exactly as in the igimang. The point is generally a leaf-shaped iron sheet, inserted in a slit in the ivory tusk, and riveted. Sometimes, however, a straight iron rod is used as a point. The butt-end, whenever possible, is fitted with a heavy iron spike (turuk), which is stuck through a loop in the line into the ice, to hold a wounded animal that is too strong for the hunter. The shaft of both the lance and the harpoon has an attachment which is intended to support the hand. It consists either of a small ivory peg or of a long piece of wood or ivory lashed to the shaft by its flat part (Fig. 17), while the point in front serves as a support for the hand.

Fig. 17 ($\frac{60}{401}$). Hand-support of Harpoon-shaft. $\frac{1}{2}$ nat. size.

The bone or ivory cap on the end of the shaft (qateq) is either fitted to the shaft by thongs which pass through both the pieces to be joined, or it covers the thinned end of the shaft cap-wise, being held in place by pegs or rivets. The same is true of the

cap on the ivory foreshaft. It is rather curious that the qateq at Smith Sound, whether on lance or harpoon, tapers down ; while among other tribes from East Greenland to Hudson Bay, it expands, being greater in diameter at the socket than where it joins the shaft. The lance shown in Plate XI, Fig. 4, is an exception ; but in this case the qateq consists of the leg-bone of an animal, chosen, no doubt, on account of its ready-made socket.

Sometimes the lance has a bladder attached to the shaft. In this it resembles the agdligaq of Greenland and Baffin Land. But the Baffin Land agdligaq is a small harpoon with a harpoon-head (naulang) ; and in Greenland the same weapon, though lacking the detachable head, is practically a harpoon rather than a lance, because its iron point is barbed (see the plate in CRANZ, p. 192). At Smith Sound, however, this weapon is only a lance with attached floating bladder.

Fig. 18 ($\frac{60}{1096}$). Float and Drag.

When seals are hunted from the kayak, the line is not retained by the hunter after he has harpooned the animal. In this case a float (avataq) consisting of an inflated whole sealskin, and a drag (Fig. 18), are attached to the end of the line, and prevent the animal from escaping. The float has an ivory mouth-piece (Fig. 19, *a*, *b*) to allow of convenient inflation ; this is closed with a wooden peg. The tail is tied firmly around a piece of wood (Fig. 19, *c*). Holes in the float are closed by inserting a small ivory button (Fig. 19, *d*), and tying the skin around its shank. The wounds and holes in the skin are closed with ivory plugs (tuputa),

Fig. 20. The drag consists of a square or round wooden frame, over which hide is stretched. When the animal has been killed, it must be towed home. For this purpose a line containing a swivel (Fig. 21) is used.

The bird-spear (nueq, nuirn), the Smith Sound Eskimo seem not to possess, though Bessels (p. 360) states the contrary. The fish-spear (Fig. 22) that they use, called 'kakivang,' resembles the usual Eskimo fish-spear. The shaft, which broadens to a width of several inches at the lower end, is fitted with a long thin point of iron, bone, or ivory projecting from the middle of this end. On each side of this point a somewhat longer bone prong extends, curving outward a little. From the ends of these two prongs two bent nails extend inward and back nearly to the middle prong. The fish accordingly, once the points have penetrated it, is securely held from three sides. A small four-pronged fish-spear, quite different from the kakivang, is shown in Plate XI, Fig. 5. Fig. 23 represents the point of a double-pronged fish-spear; and Fig. 24, a needle for stringing fish. Fish are attracted by means of an ivory carving representing a small fish (Fig. 25), which is suspended from a string made of plaited sinew. The fish is speared when it approaches the decoy.

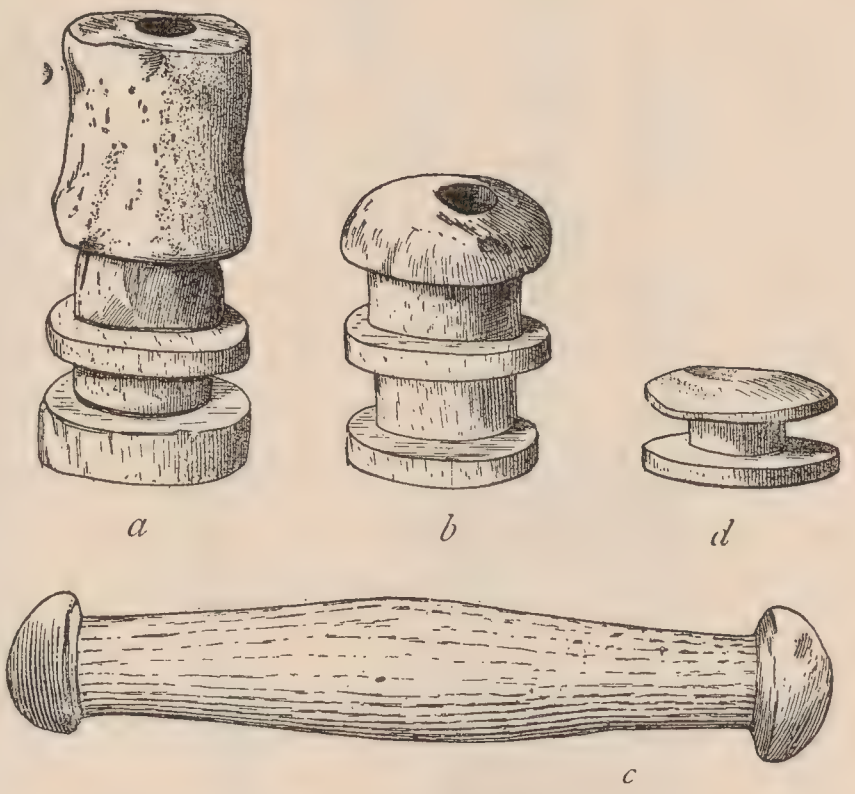


Fig. 19, *a* ($\frac{60}{228}$), *b* ($\frac{60}{297}$), Mouthpieces; *c* ($\frac{60}{298}$), Tail-piece; *d* ($\frac{60}{229}$), Button. $\frac{1}{2}$ nat. size.

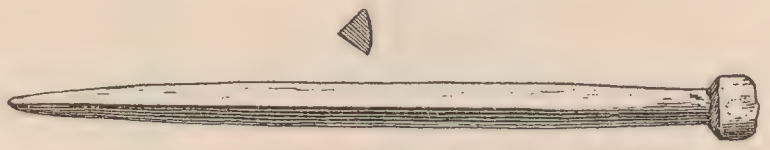


Fig. 20 ($\frac{60}{324}$). Ivory Plug. $\frac{1}{2}$ nat. size.

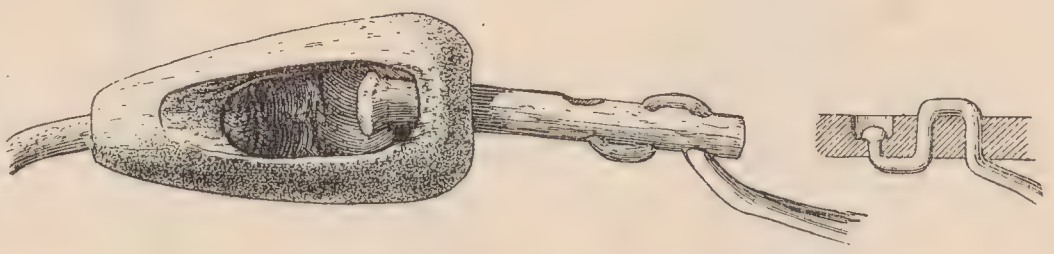


Fig. 21 ($\frac{60}{447}$). Swivel. $\frac{2}{3}$ nat. size.

Knives are now generally obtained from the whites. When the

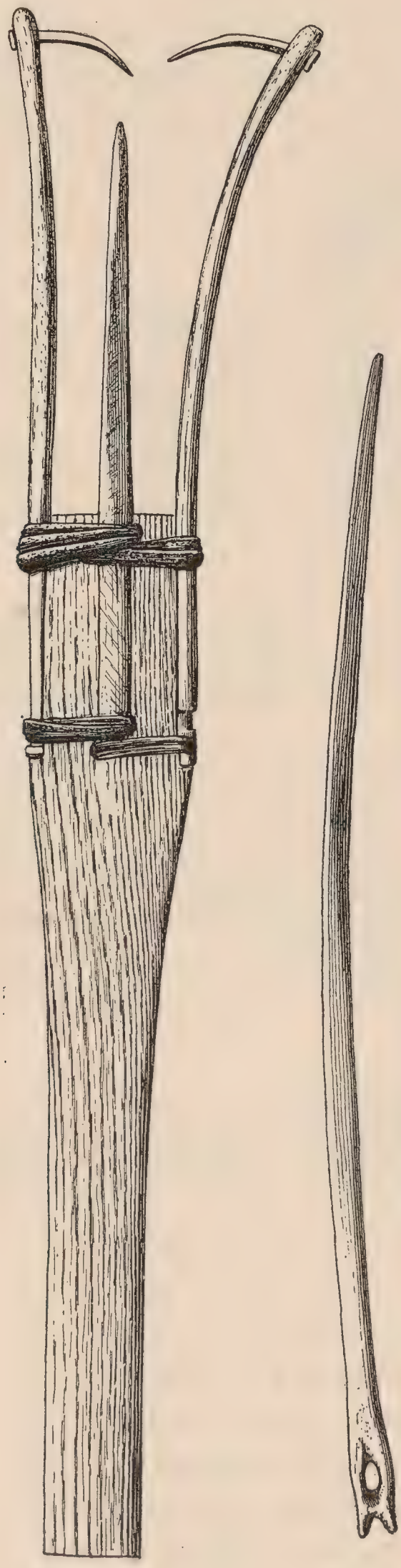


Fig. 22.

Fig. 23.

Fig. 24.

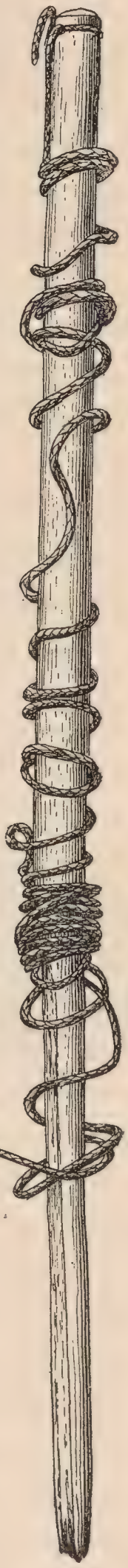


Fig. 25.

Fig. 22 ($\frac{60}{269}$). Fish-spear. $\frac{1}{4}$ nat. size.
Fig. 23 ($\frac{60}{826}$). Point of Fish-spear. $\frac{1}{2}$ nat. size.
Fig. 24 ($\frac{60}{793}$). Needle for stringing Fish. $\frac{1}{2}$ nat. size
Fig. 25 ($\frac{60}{50}$). Decoy for Fish. $\frac{1}{2}$ nat. size.

handle breaks, the blade is riveted to a new handle of bone or ivory. Small saws are fitted in the same way. Before the advent of the Europeans, knives were of course much more crude; but both in this respect and in regard to harpoon-heads the Smith Sound Eskimo were more favorably situated than other tribes, who were dependent on flint; for in the three large meteorites from the vicinity of Cape York (which Lieut. Peary conveyed to the American Museum of Natural History in 1897) they possessed a source of native iron. It was of course impossible, by means of stone, and without the aid of fire, to secure more than small fragments of the metal, and the average size of the pieces, when beaten out flat, was perhaps no greater than a fingernail; but several of these pieces, joined in a row in the haft of an ivory handle, made a blade that was no doubt superior to an edge of flint. The Museum possesses no knives of this ancient pattern; but there is one in the possession of Lieut. Peary; and Ross gives a good illustration of one, which is reproduced in Bessels, p. 362. A large modern knife is shown in Fig. 26.

Fig. 26 ($\frac{60}{2368}$). Knife. $\frac{1}{5}$ nat. size.

The iron of the present hatchets is of course also obtained from the whites, though the manner of attachment of the head to the handle, and the latter itself, are Eskimo. Where the amount of iron is insufficient, the head of the hatchet is made of bone, the iron forming the edge (Fig. 27). The hatchets are used principally for chopping frozen meat.

The bow-drill is a most valuable tool of the Eskimo. Even now, with better facilities for carving and cutting ivory than in former times, some harpoon-heads bear marks of having been fashioned into shape, not with a cutting-edge, but with the drill. Holes were drilled closely together in a row, and then the bone or ivory broken along the row of holes. The bow, the string of which is wound around the drill and serves to rotate it, is a curved piece of rib. The wooden or ivory shaft of the drill is provided

with an iron point; while above it fits into the socket of the kingmiaq, an oblong piece of ivory shaped so as to allow of a firm hold in the mouth of the workman.

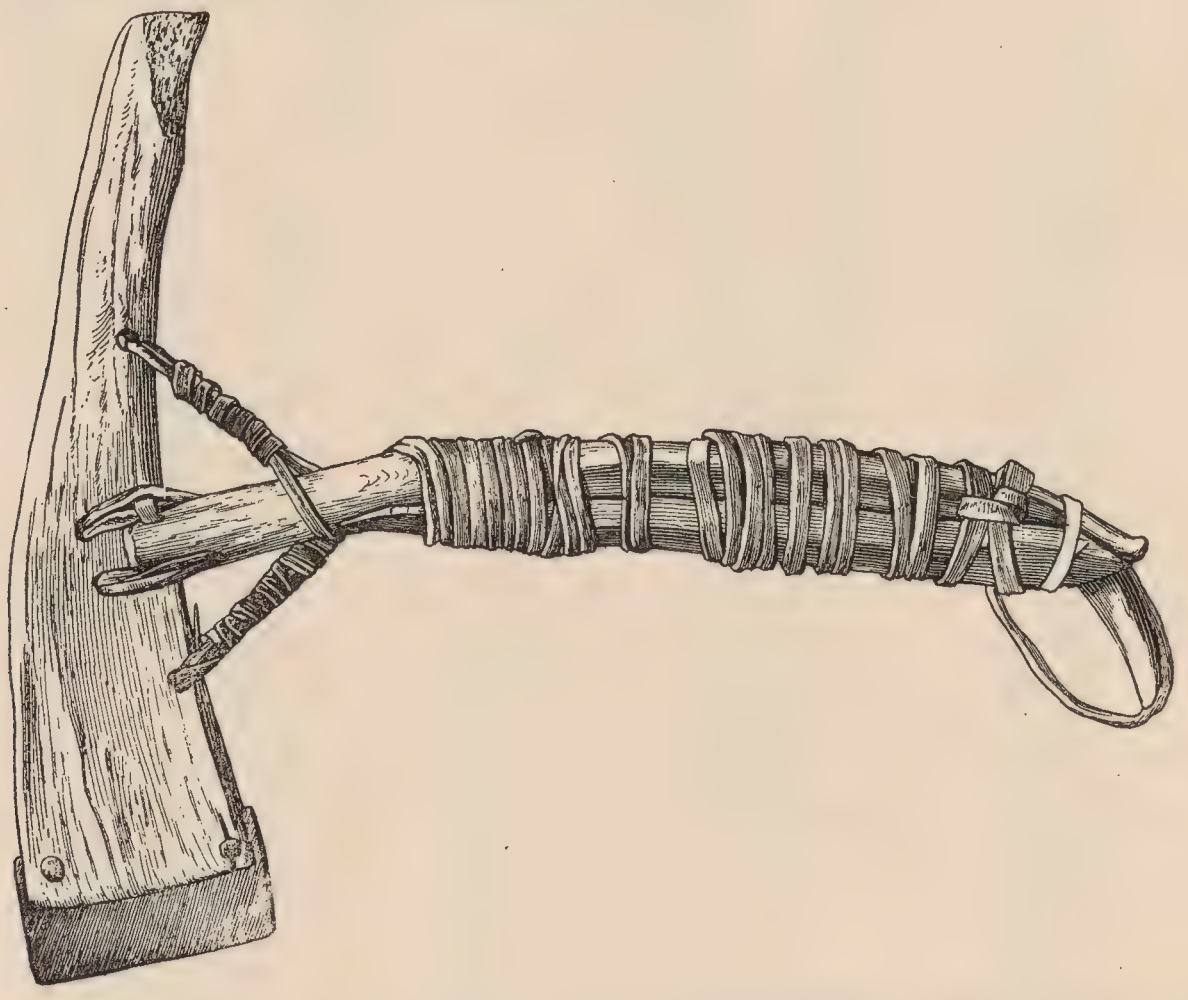


Fig. 27 ($\frac{60}{242}$). Hatchet. $\frac{1}{4}$ nat. size.

The woman's knife (ulu) is similar to that in use among other tribes; but it assumes a great variety of forms, according to the amount or shape of the materials of which it is made, and the manner in which the different parts are joined. Fig. 28, *a* and *b*, shows the two usual types, while the form shown in Fig. 28 *c* is less common. Riveting of iron to iron, or iron to ivory, is now not uncommon; but the older method seems to have been to use glue or cement. When the handle consists of two pieces of ivory, these are not joined together by thongs (as, for instance, are the shaft and qateq of the harpoon), but cemented, or at most tied and cemented. The scrapers with which the women clean skins consist of a wooden handle and a tin or sheet-iron blade, the edges of which turn up in shovel fashion (Fig. 29). In this case also we find several methods of joining the parts of the implement. The wooden handle may be split, the tin inserted, and held fast by wedges; or the handle, held on three of its four sides by the metal, may be wound about with sinew; or the pieces may be riveted together. Needle-cases consist of ivory tubes of the

Fig. 28 *a*.

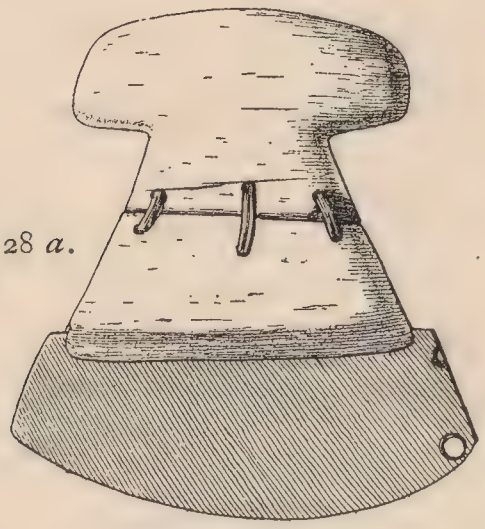


Fig. 28 *b*.

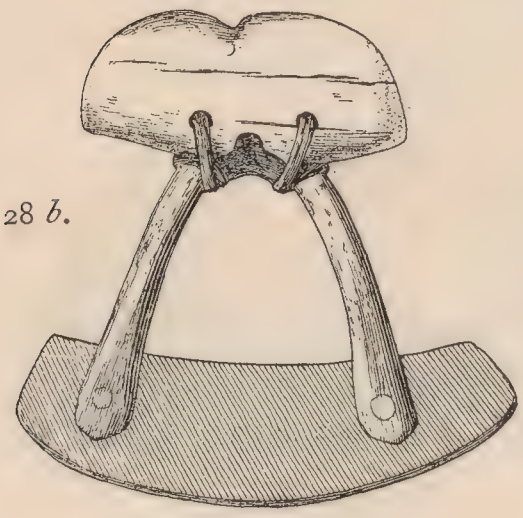
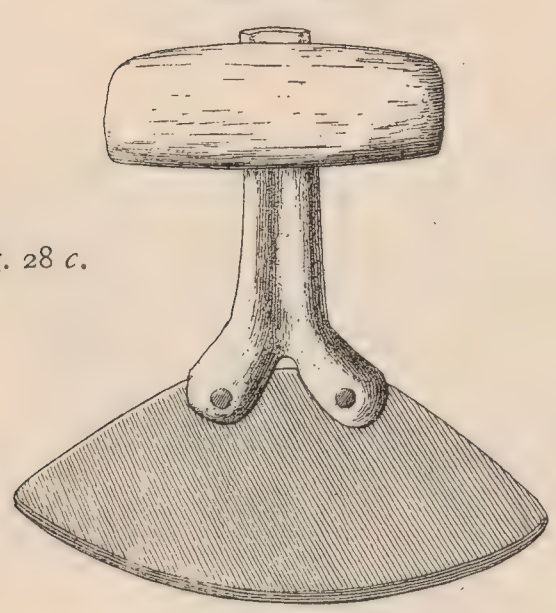


Fig. 28 *c*.



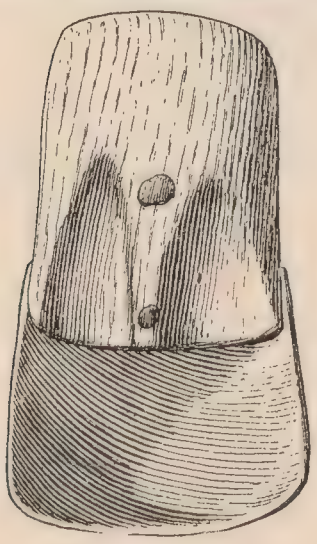


Fig. 29.

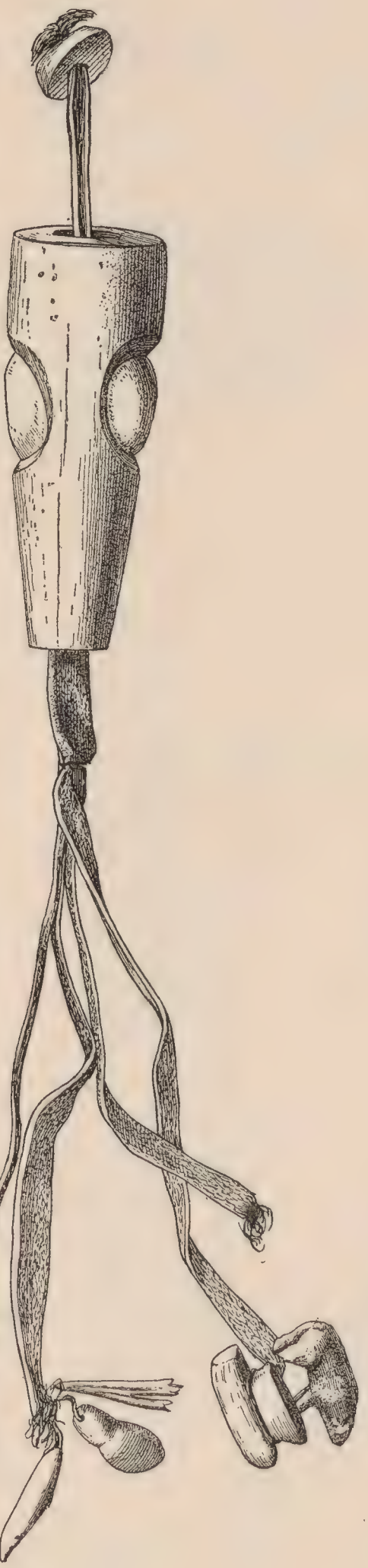


Fig. 30.

Fig. 28, *a* ($\frac{60}{715}$), *b* ($\frac{60}{721}$), *c* ($\frac{60}{719}$). Woman's Knives. $\frac{2}{5}$ nat. size.
Fig. 29 ($\frac{60}{729}$). Scraper. $\frac{2}{5}$ nat. size.
Fig. 30 ($\frac{60}{8}$). Needle-case. $\frac{2}{5}$ nat. size.

form shown in Fig. 30. The needles are put into a strip of leather ornamented with ivory carvings and bits of stone. The leather strip is drawn into the tube.

Buckets for holding or carrying water are made of sealskin (Fig. 31), and vary greatly in size. Drinking-cups are round, or more rarely oval. They have a wooden bottom, to which is cemented a perpendicular rim. When the cup is large, one piece of wood is used, being bent all around the bottom. When the cup is smaller, the rim consists of two very thin pieces of ivory or bone, each forming half the circumference of the vessel (Fig. 32).

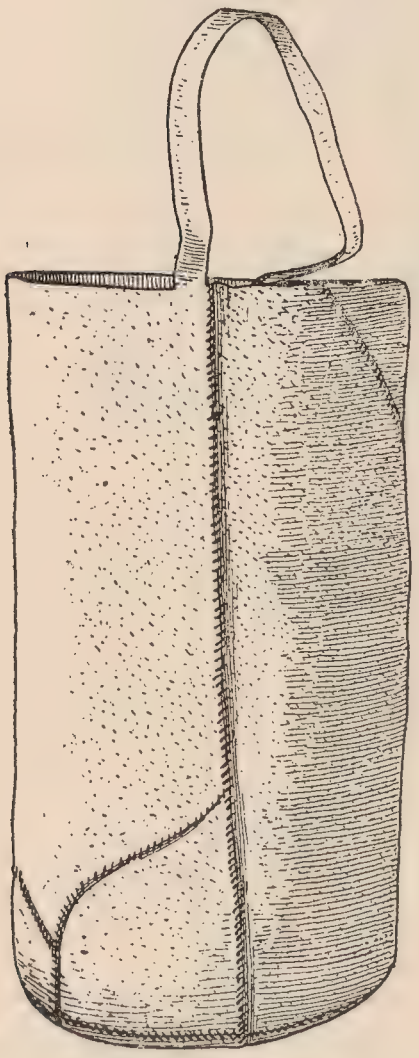


Fig. 31 ($\frac{60}{256}$). Bucket. Height, 7 inches.

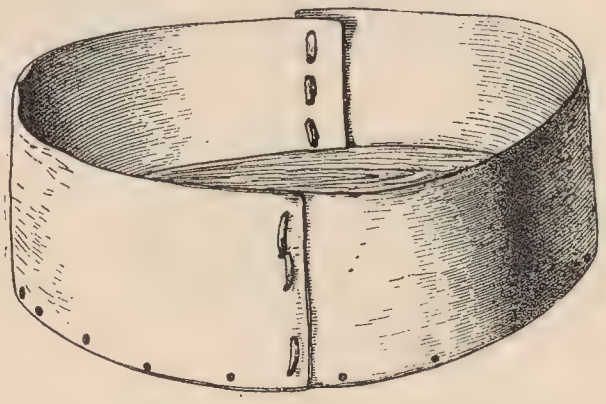


Fig. 32 ($\frac{60}{58}$). Cup. $\frac{1}{3}$ nat. size.

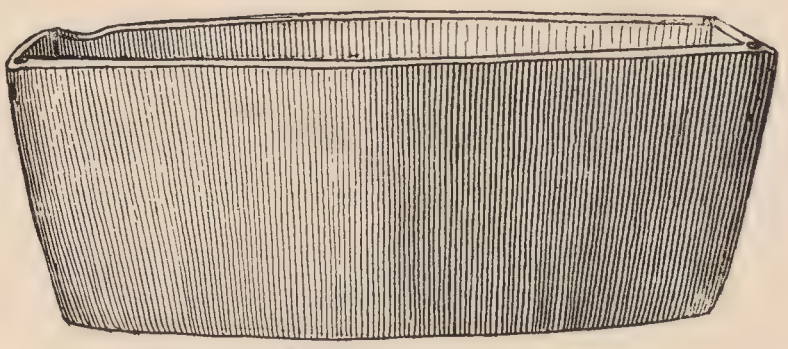


Fig. 33 ($\frac{60}{425}$). Pot. $\frac{1}{8}$ nat. size.

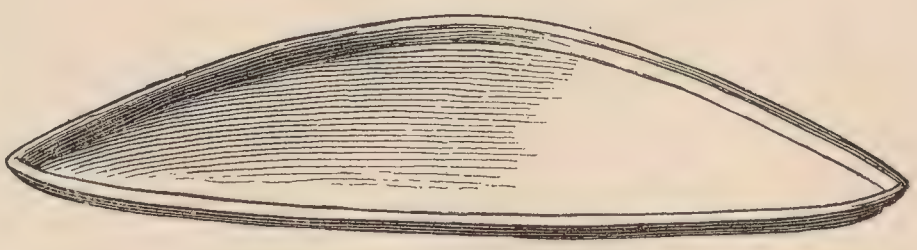


Fig. 34 ($\frac{60}{419}$). Lamp. $\frac{1}{8}$ nat. size.

Pots (Fig. 33) are made of the soft steatite always used by the Eskimo for this purpose when it can be obtained. The usual shape is oblong, with slightly convex sides and rounded corners. The stone is said to occur in fragments of various sizes; but only the smaller pieces can be used, as the natives have no means of breaking or working those of a larger size. Iron, or a white stone (flint?), is used to carve the stone, which is easily worked.

Lamps (Fig. 34) are made of the same material. They are more or less triangular in shape. The wick consists of dried moss; and for striking fire, pieces of pyrites or stone containing pyrites are used.

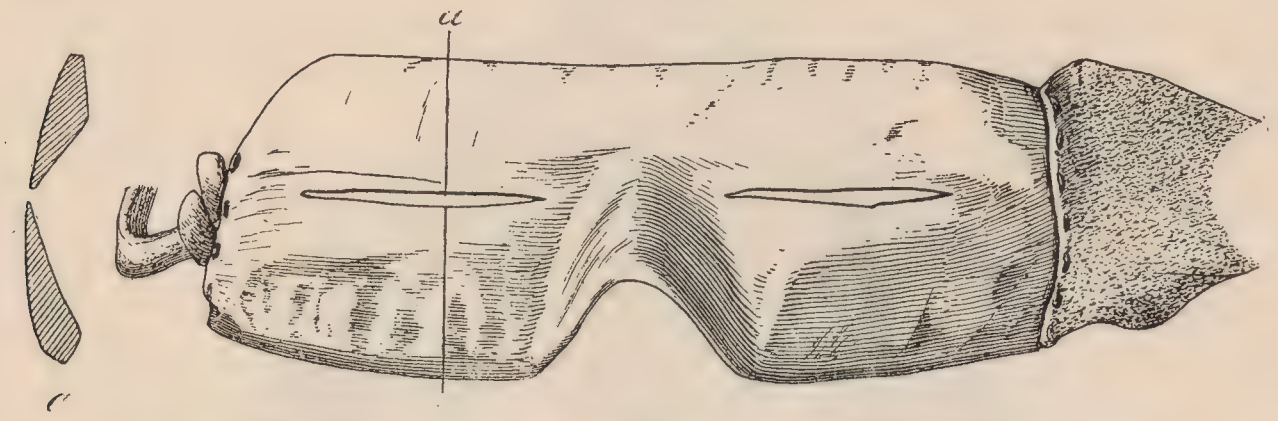


Fig. 35 ($\frac{60}{53}$). Snow-Goggles, and Cross-section at *a a*. $\frac{1}{2}$ nat. size.

Fig. 36 ($\frac{60}{785}$). Scratcher. $\frac{1}{5}$ nat. size.

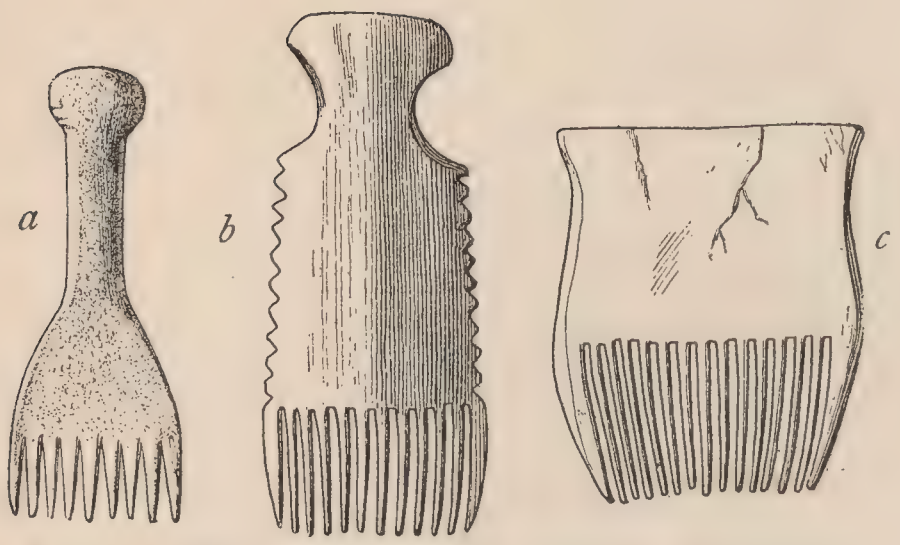


Fig. 37, *a* ($\frac{60}{963}$), *b* ($\frac{60}{786}$), *c* ($\frac{60}{787}$). Combs. $\frac{1}{2}$ nat. size.

Fig. 38 ($\frac{60}{779}$). Necklace. $\frac{1}{3}$ nat. size.

Of objects for personal comfort, wooden goggles, to protect the eye from the glare of the snow, may be mentioned (Fig. 35); and the kumakssiun (Fig. 36) (literally, 'instrument used against lice'), a long, slightly curved piece of bone with a piece of

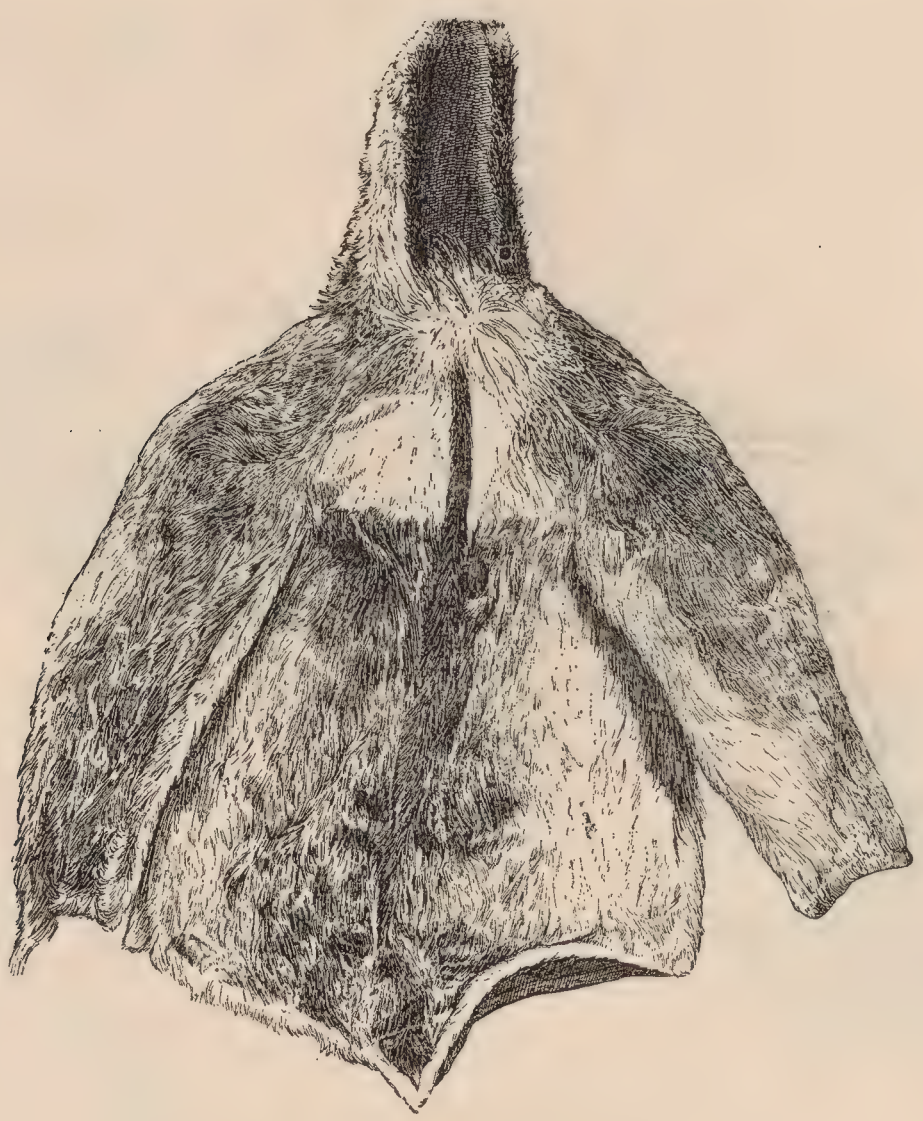


Fig. 39 ($\frac{60}{571}$). Man's Jacket, Front and Back.

bear-fur on the end. Combs are made from ivory (Fig. 37). The women wear necklaces of skin, to which several drops or pendants of ivory are attached (Fig. 38).

The clothing of the Smith Sound Eskimo consists of a coat with sleeves and a hood, breeches, inner boots or stockings, and outer boots. The dress of men and women, allowing for minor differences of cut and pattern, is very similar. The chief difference is that the men's breeches reach to the knee; while the women's are exceedingly short, and the boots in consequence extend the whole length of the leg. Besides this, women with an infant have their hood so enlarged as to form a bag in which to carry the child. All the clothing seems very scant, as there is practically no overlapping between different pieces. The most frequent material used is the skin of the nateq (*Phoca fœtida*), but various furs are also much used.

The ordinary jacket of the men will be seen in Fig. 39. It reaches little farther than to the hips, but is somewhat longer front and back than on the sides. It is made of the skin of *Phoca*

Fig. 40 ($\frac{60}{85}$). Man's Breeches.

fœtida. A pattern is regularly obtained by the combination of lighter and darker pieces of skin. The middle of the front and

back is dark, the two sides lighter. The upper part is light, but bisected vertically by a narrow black strip running up to the throat. Over the shoulder-blades are two clear-cut white areas, from which two white stripes extend some distance down the back. Sometimes, in the dark area between the stripes, there is a small white circle with a dark centre. The sleeves vary around a medium gray; they are generally darker in front and on the outer side, lighter behind and on the side next the body. The hood is edged with dark trimming; the lower end of the coat and sleeves, with a corresponding light-colored border. Sometimes a narrow stripe of contrasting color runs over the top of the hood; sometimes this is absent. At throat and wrists there is a little bear-fur.

The outdoor winter coat of the men is illustrated in Plate XII. It consists of rabbit and partly fox fur, and is entirely white but for the black edging of the hood surrounding the face, and a dark gray area at the back of the hood. Sometimes the coat is made of dark fur, and in this case there is a white band passing over the top of the hood and the shoulders. Mittens are made of sealskin or deerskin.

The breeches are made of polar-bear fur (Fig. 40). They are very low, especially in front; but even the back is exposed when the wearer bends forward. They extend a little below the knee.

Men's boots reach to the knee. The chief difference between the inner and outer boot is that the former is made of deer, fox, or rabbit skin, the fur being turned inside; while the outer boot is made of bear-fur, having the hair outside, or of dressed sealskin (Fig. 41). The sole of the boot is turned up all around the foot, and is joined to the triangular piece covering the instep. The leg of the inner boot consists of two pieces, and consequently has two seams, one on each side; the leg of the outer boot consists of one piece,

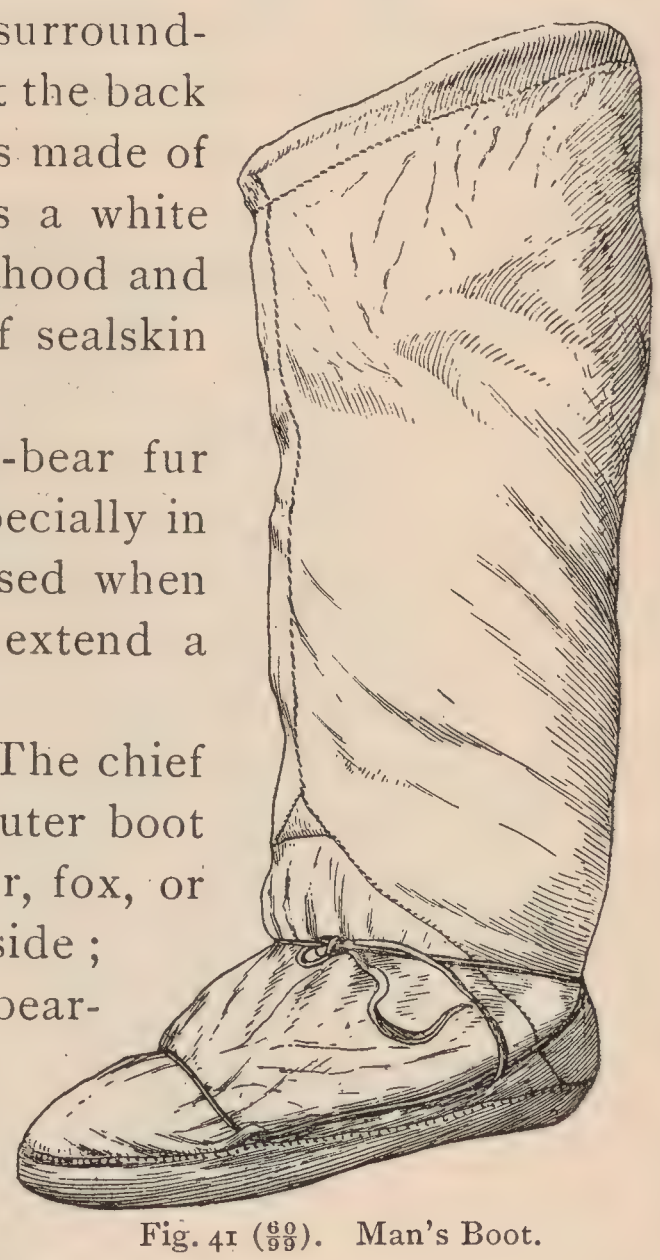


Fig. 41 ($\frac{60}{99}$). Man's Boot.

joined in one seam along the front of the leg. The same difference is found in women's boots. Various irregular triangular pieces are needed at the instep and the top of the boot.

The women also wear shirts or inner jackets of bird-skins, which are worn with the feathers next to the skin. The back of these shirts is sometimes covered with a piece of seal-skin.

Fig. 42 ($\frac{60}{619}$). Woman's Jacket, Front.

The woman's jacket (arnap netia) differs little from the man's, except for the greater size of the hood (Fig. 42). Below, in front, it tapers more or less suddenly to a point (kininga); behind (Fig. 43), the lower edge is nearly level, with a leaf or lance shaped point (akunga) in the middle. As in the man's coat, there is a seam running across the garment over the chest from armpit to armpit, the fur above and below this line contrasting somewhat in color; and the upper piece is divided in two by a patch or tongue of contrasting color (manuq) over the sternum. The usual arrangement of the colors or shades which occur when the fur of *Phoca fœtida* is used, is as follows. From each of the two bottom points, upward to the edge of the hood,

there is a dark stripe, gradually shading off to light on both its sides. The stripe behind passes over the top of the hood;

Fig. 43 ($\frac{60}{2972}$). Girl's Jacket, Back.

the stripe in front, after passing the above-mentioned armpit to armpit line, becomes divided by the lighter-colored tongue (manuq). Just below the armpit line, over the breasts, are two pretty sharply defined dark areas. The sleeves, except behind, are also dark. All the rest of the garment is light-colored. The effect is heightened by means of narrow edgings about a third of an inch wide, which contrast with the color of the adjacent area. Along the bottom of the jacket there are in places two or even three of these strips, being alternately light and dark. These strips are found around the lower edge of the garment, along the edge of the hood, down the length and around the ends of the sleeves, over the shoulder, down the middle of the manuq, and sometimes down the sides of the body of the jacket. If the pieces of which the jacket is made are not very large, great ingenuity is necessary to piece them together so that the above color-

contrast pattern may be obtained, and the cut of the pieces will be very irregular. Generally, however, the piecing follows a regular type more or less closely, and, though not very simple, is systematic. For the two main pieces of the coat, the front and the back, two sealskins are used, the dark back forming the middle of the piece; so that the two central stripes described are formed naturally. The front piece reaches only up to the armpit line, and is, roughly, pentagonal. The back piece is much longer, inasmuch as it includes the back of the hood; besides this, it has two side projections or wings just above the shoulder, which reach around the neck almost to the throat. A third piece, which is very small, forms the middle of the top of the hood. The remaining pieces are all double, occurring on both sides of the coat. One is needed for each sleeve; five cover each side of the chest and armpit; and four more on each side complete the hood. There are thus, in a jacket that may be considered typical, about twenty-three distinct pieces, not counting the strips of edging, which are nearly as numerous. Where the hood is small, as in a young girl's jacket, the number of pieces becomes somewhat less; but generally it is more likely to be more than the number stated, owing to irregular patching together of small pieces to make the large ones. Girls' jackets (Plate XIII) differ from those of women in having a small hood similar in shape to that worn by men.

A heavier jacket for women is made of thick deer-fur, but in general cut resembles the ordinary sealskin jacket.

Fig. 44 ($\frac{60}{700}$). Woman's Breeches.

The women's breeches (Fig. 44) are legless trunks, and are generally made of thick fox or rabbit fur, lined with soft bird-skin. The front is white, except a small dark tongue above in the middle; the back is dark, except a short light tongue below in the middle. The leg-holes are edged so that there is a contrast with the adjacent fur.

The inner and outer boots of the women (Fig. 45),to make up for the shortness of the breeches, are much longer than the men's. The inner boot is made of caribou-skin with the hair inward and the seams outside; the outer boot consists of tanned sealskin, with the seams inside. The leg of the inner boot consists of two pieces joined along the sides of the boot; the leg of the outer boot consists of one piece seamed down the front. This arrangement resembles that of the men's boots; but the latter generally contain a considerable number of small irregular pieces that are dispensed with in the women's boots.

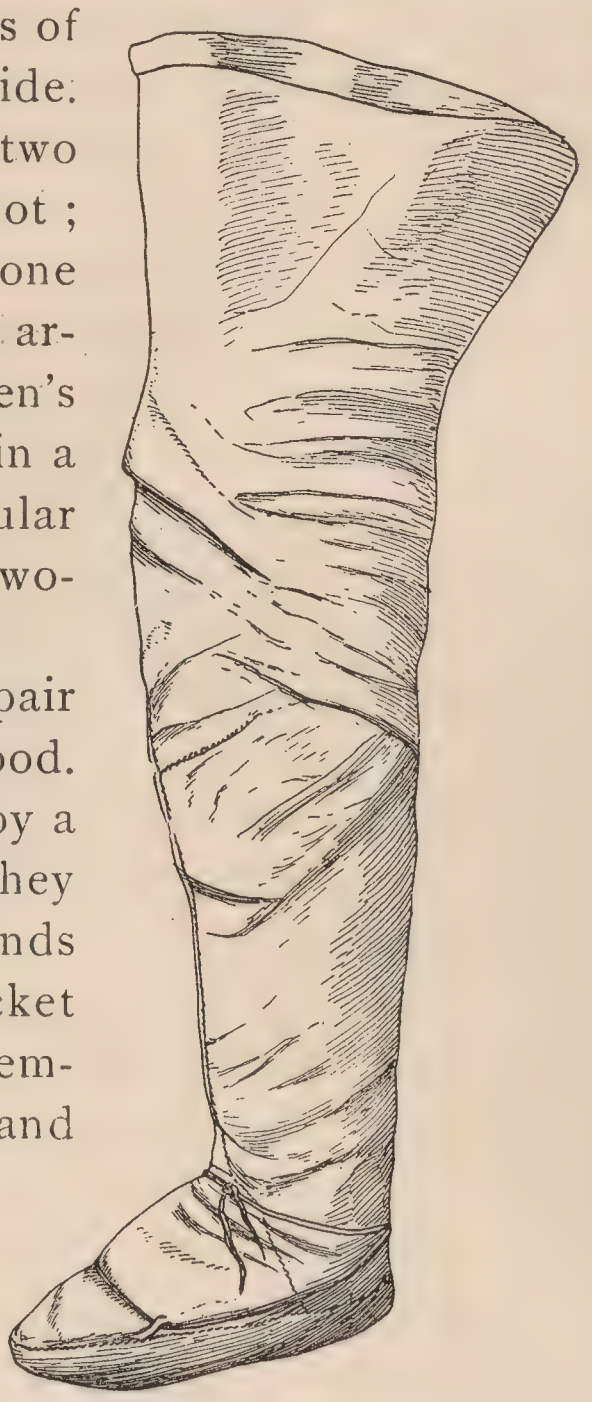


Fig. 45 ($\frac{60}{29971}$). Woman's Boot.

Children's clothing consists of a pair of leggings, a shirt, a jacket, and a hood. The leggings (Fig. 48) are connected by a strip of deerskin along the back. They are fastened in front by tying the free ends of the strip around the waist. The jacket (Fig. 46) is made of fawn-skin. It resembles in shape that of the adult males and females, but it has no hood. In front there is a slit extending down a considerable distance. It is tied around the neck by means of strings. The shirt (Fig. 49) is made of skins of dovekies, and is of the same shape as the jacket. The hood (Fig. 47) is made of the skin of the head of a fawn, and seamed over the neck in front. It has a long tip reaching down behind. The edge around the face is trimmed with deerskin; the edge around the neck, with bear-skin. A string is attached to each side for tying it down around the neck.

Of games, the collection in the Museum contains: the ajagaq (Fig. 50),— a leg-bone with a hole bored through each socket and a thin stick (ajau′tang) tied by a short string to the bone, the latter being thrown up to be caught in either hole with the stick; the hieqtā′q (Fig. 51), or bull-roarer,— a flat bone in the shape of an hourglass or figure eight, with a looped string

Fig. 46.

Fig. 47.

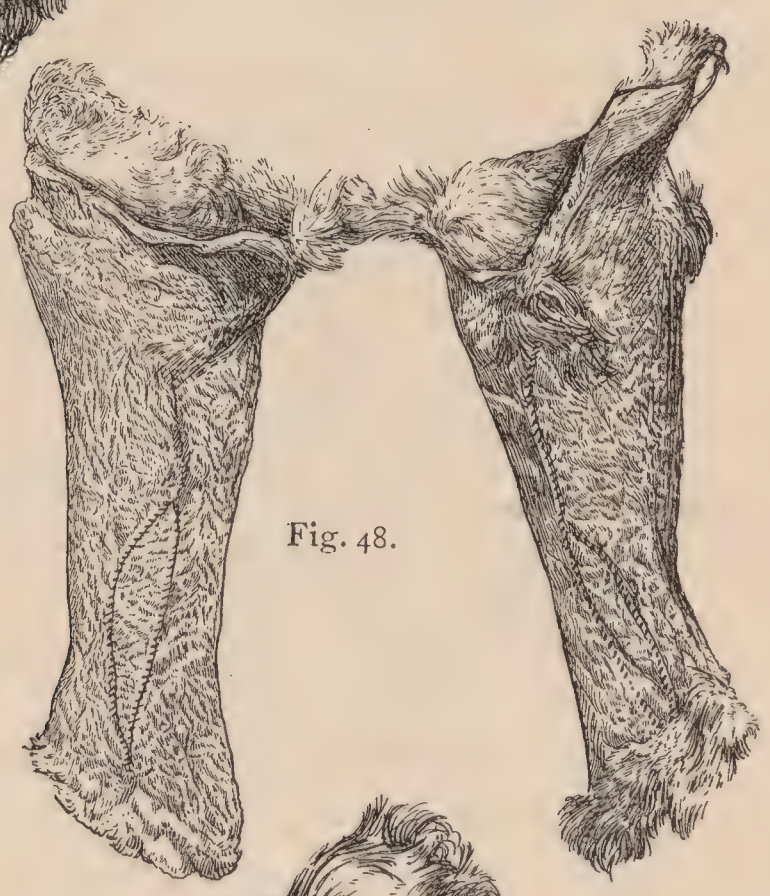


Fig. 48.

Fig. 49.

Figs. 46–49 ($\frac{60}{2973}$–$\frac{60}{2976}$). Infants' Clothing.

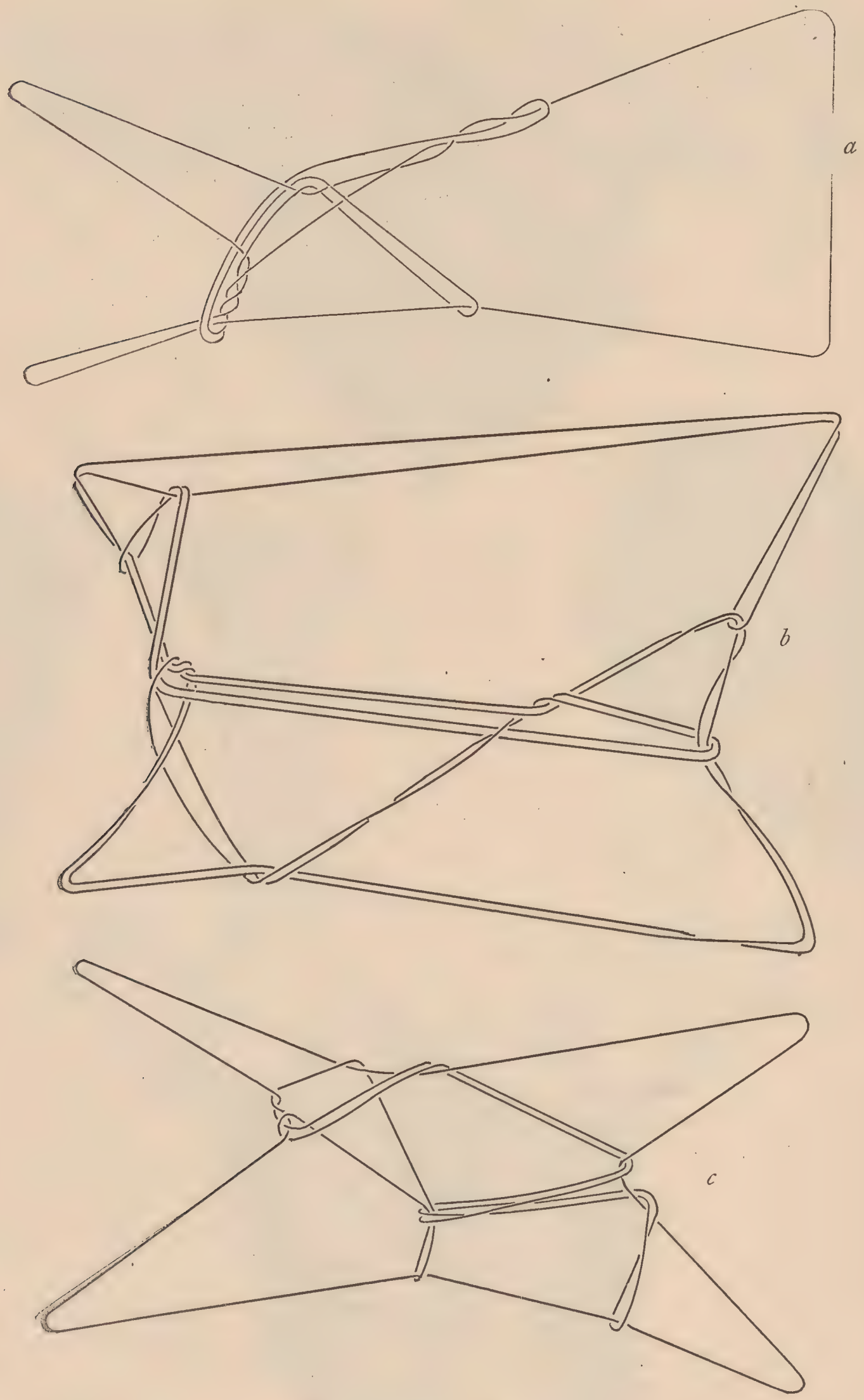


Fig. 52. Cat's-cradle.
a ($\frac{60}{912}$), Fox ; *b* ($\frac{60}{910}$), Raven ; *c* ($\frac{60}{909}$), Polar Bear.

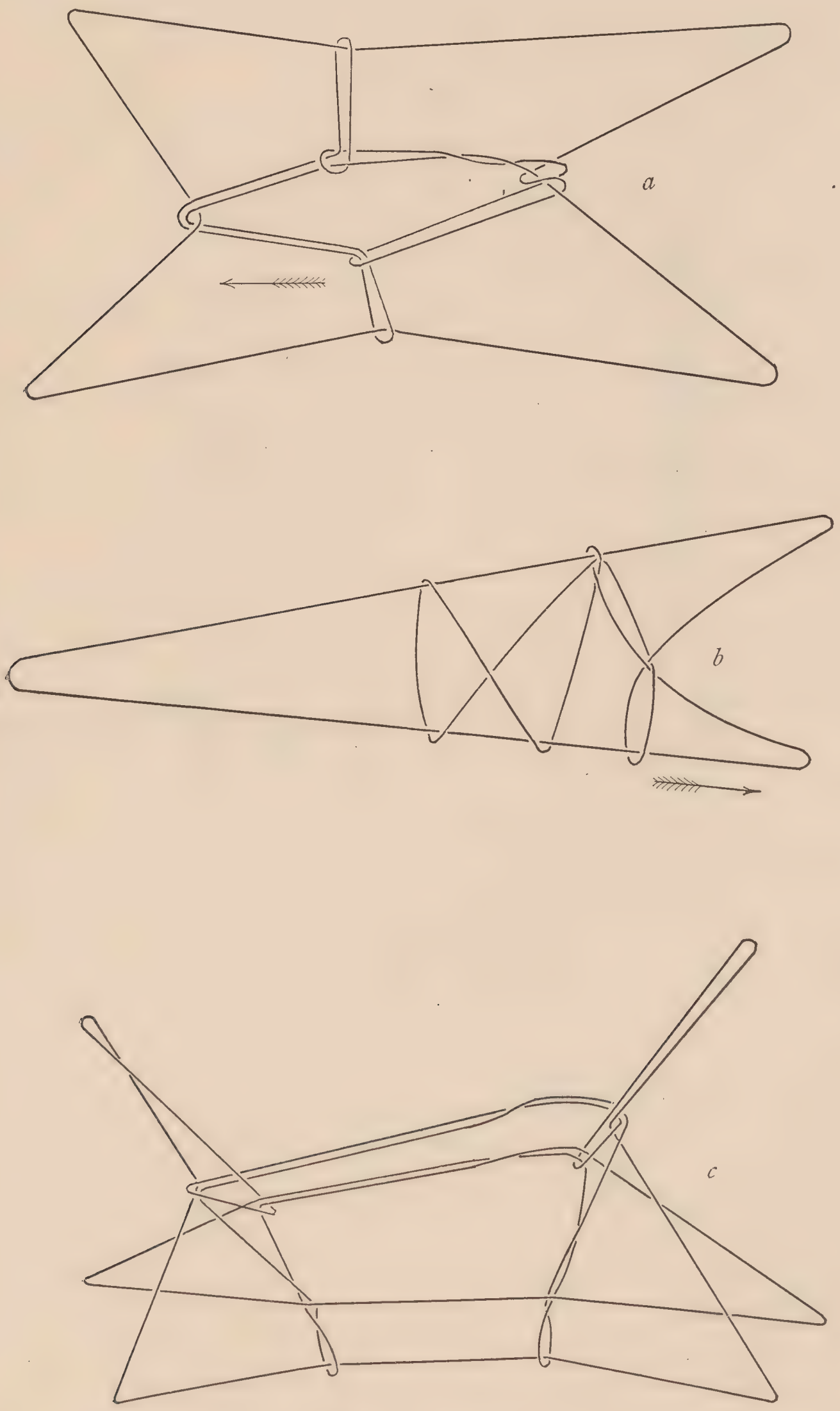


Fig. 53. Cat's-cradle.

a ($\frac{60}{913}$) Narwhal *b* ($\frac{60}{911}$), Hare; *c* ($\frac{60}{914}$), Walrus-head.

passing through its middle ; and the 'cat's-cradle' (Figs. 52, 53), — a string to be drawn by the fingers into the shapes of various objects or animals.

Among amusements is ball-playing. The ball is of sealskin, and is stuffed with scraps of skin so as to be hard. The Adlet among them also juggle, some with as many as five pebbles at once. Wrestling, and finger and arm pulling, are also indulged in. Sometimes men go out in their kayaks to show their skill, coming as near as possible to upsetting. In general the Smith Sound Eskimo are less skilful in handling their kayaks than the Greenlanders. When upset, they cannot right themselves, and hence never go out alone. The boys have toy harpoons.

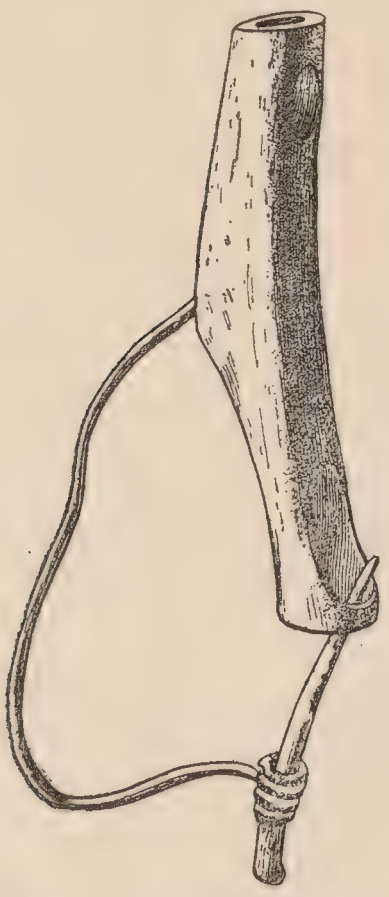


Fig. 50 ($\frac{60}{333}$). Bilboquet. $\frac{1}{4}$ nat. size.

The art of the Smith Sound Eskimo is by no means as well developed as that of other

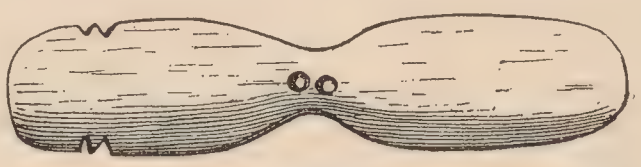


Fig. 51 ($\frac{60}{44}$). Bull-roarer. $\frac{1}{3}$ nat. size.

Eskimo tribes, such as those in Alaska and East Greenland ; but some of their work is by no means despicable. This is true especially of their carvings of animals in ivory or bone. Their execution of the human figure is perhaps equally good, but its faults of proportion, etc., are more noticeable to European eyes. On Plate XIV are shown a number of these small figures. A needle-case (iviqterau'tin) with carved attachments is shown in Fig. 30.

The social organization of the Smith Sound Eskimo is very loose. Peary says (p. 492) that they are absolutely free, and possess no government.— They apply the term 'naligaq' to leaders of Arctic expeditions, such as Kane and Peary ; but if used in reference to any of themselves, it means merely a good hunter. Nalegak is the most skilful hunter, but he has no authority, says Hayes (p. 256). Destitute as they are, they exist, both in love and community of resources, as a single family (KANE, p. 211) ; and while it is inevitable that there should be men with more influence than others, they lack any [official] authority whatever.

There is a community of food as of dwellings, only clothing and implements and utensils being personal property. Hospitality is a matter of course. According to Hayes, it is never refused and never offered. There is considerable visiting and constant travelling about.

They profess to have no murder among them, but always mention the Adlet in this connection, who have the reputation of being savage and fierce. As a matter of fact, murders seem to occur relatively as frequently as among other Eskimo tribes. Kane speaks of three in two years, and Hayes and Peary also give instances. Infanticide is not uncommon. When a woman dies who has a child that she is still carrying in her hood, it is buried with her. A woman losing her husband always exposes or strangles her infant. "The child is killed because it has no father," the Eskimo say ; and the woman's act is not regarded as wrong. Kane (p. 71) mentions a case of infanticide where both parents were living.

Sometimes a man has two wives. When the wife had no children, it has happened that the husband left her. The parents of a girl are said not to influence her choice, nor do they receive any presents. The young couple live with the parents of either, or alone, according to circumstances and convenience. — Hayes says that the bride is often carried off by force, making a show of resistance, but, when once in the house of her husband, is contented. Children are betrothed, the girl at times being far older than the boy. — Peary (p. 496) says that there is no marriage ceremony. Morals are not high. A wife can be sold, exchanged, loaned, or borrowed. Betrothals are frequently made by the parents of the children. The girls marry early, but never have children before three years after puberty. The functions of motherhood cause hardly any inconvenience. Abortions are caused by the heavy labor of house-roofing. Young couples frequently change partners until suited, but thereafter the marriage is ordinarily permanent. In a case of two rivals for a widow, thei suits were decided by a wrestling duel, which was peaceable and conclusive. The winner, however, lost the woman in a similar match with a man already married. (An incident like this is mentioned in a Greenland tale ; see Rink, *T. and T.*, p. 265.) Mrs. Peary (p. 85) mentions two men, one of them from the

West Coast, who exchange wives every other year. They, however, are the only ones in the tribe. The men approve, the women disapprove, of the custom. — The widespread custom of pretending to carry off the bride by force, even after her consent is secured, prevails (BESSELS, p. 367). Bessels also describes the ceremony of what he regarded as a divorce. The husband, in a well warranted fit of jealousy, had stabbed and wounded his wife. A separation was therefore decided upon. The woman lay on her back, on the bed of a neighboring house, her legs drawn up. One of the eldest women in the tribe held her head by means of a thong fastened around it. For two hours she raised and lowered her head by this thong, singing monotonously and unintelligibly in a low voice. The woman then went off to her lover, her new husband. It seems more likely, however, that the ceremony here described was a medical treatment for the wound than a divorce.

There are said to be no fixed festivals of any kind, nor the qaggi ('singing-house') of the Western tribes; but Peary (p. 274) says, "In the evening we went to a large, unoccupied

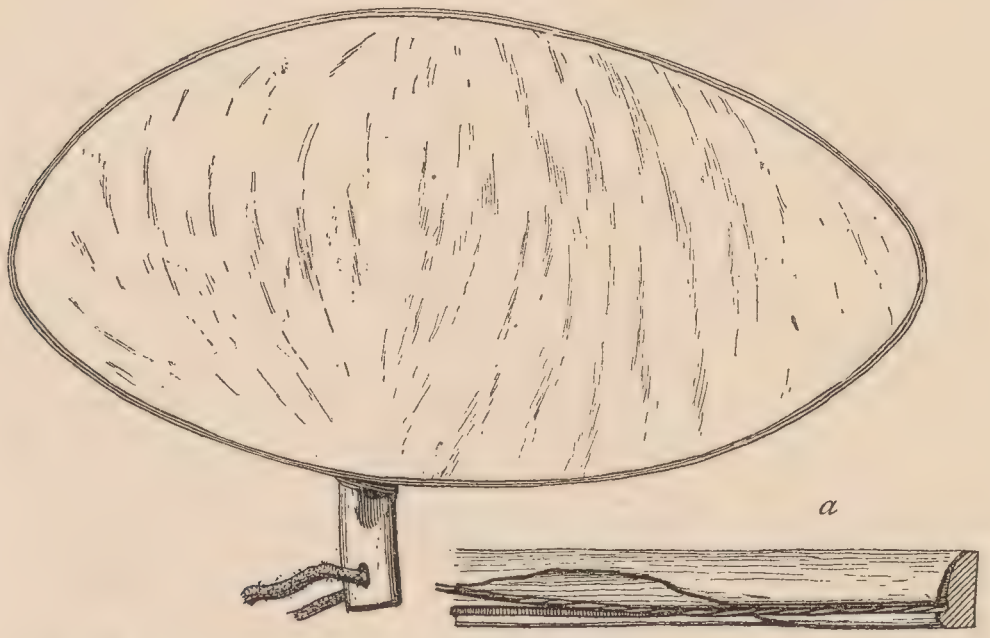


Fig. 54 ($\frac{60}{230}$). Drum, $\frac{1}{6}$ nat. size; *a*, Detail sketch of rim of drum, showing method of fastening drum-skin, $\frac{1}{3}$ nat. size.

igloo, which was utilized by the young people as a sort of playroom. All the children of the village were here engaged in games." When any one has a larger supply of meat than the rest, there is likely to be a gathering and a feast at his house, accompanied sometimes by singing. Several of their melodies are given by Boas (p. 658). At dances the women sit naked in bed

with the infants. The men sit on the edge of the bed, the children on the floor. The dancers are two, and alternately use the drum (Fig. 54), which consists of seal intestine stretched over an elliptical bone frame. It is beaten with a walrus-rib. Only the shamans (angakut) use words when singing; others sing merely 'Aja.' ("In winter come the songs and improvisations of the angakut. In the choruses of these the entire assembled company join." — PEARY.) However, the Smith Sound Eskimo are not altogether without the satiric songs of the other Eskimo tribes.

The year is divided into months (aningan, 'moon'). Of these, about three are given to winter, two to spring, four to summer, and three to autumn; but ordinarily time is reckoned, except in winter, not by moons, but by the arrival and departure of birds and animals, etc., as in Greenland (CRANZ, p. 293).

The practical religion and ceremonial, as distinct from the cosmology, of the inhabitants of Smith Sound, cluster about shamanism. As with other Eskimo tribes, the shamans are called 'angakoq.' A considerable number of the inhabitants are angakut (six out of fourteen individuals once enumerated to me) and according to Ross (p. 128) they generally had one in every family. Women as well as men are angakut. Any one may become an angakoq; that is, there is nothing to prevent him from trying. The procedure is as follows: The person desirous of becoming angakoq asks an older angakoq where to make his trial, saying nothing about his attempts to others until he has succeeded. He goes alone at night to a place where the rock is hollow, and resounds when trod upon: that is, to a cavernous cliff. He walks straight toward this. If he is to be an angakoq, he will walk into a hole or cave in the hill; if not, he will strike the face of the cliff. When he has entered, the cavern closes upon him. When it re-opens, he must go out, else he will be shut up forever. He is now an angakoq, but has not yet learned his powers. For this purpose he must go to another place, at the edge of the permanent ice-cap (serngmeng). Here in a cave in the sand (?) lives Torngaxssung, the oldest of the tornguang ('spirit;' Greenland, tôrnaq). Were Torngaxssung, however, to go near the cliff which the angakoq has previously entered, the former would die. (In Greenland any one who should vent

wind when attending an angakoq's ceremony would be killed. — CRANZ, p. 268.) Torngaxssung instructs the angakoq, asking him what sort of tornguang he wants, giving it to him and telling him how to use it. For one night he keeps the angakoq, who must then go. He is now a complete angakoq.

In Greenland the essaying angakoq retires from men, and fasts, the result being a disordered imagination, and convulsions. Some are destined for angakuneq from their youth. Others sit down before a large stone and call Torngarsuk. When he appears, the man dies of fright and remains dead three days. After that he receives his Torngaq. — CRANZ, p. 268.

"Some of the old people speak of angakussarfiks, or caves, containing a stone with an even surface and a smaller one; the angakok apprentice having to grind the first with the second until Tornarsuk announced himself in a voice arising from the depths of the earth. Others became angakok by allowing vermin to suck their blood in a dried-up lake until they became unconscious. These maintained themselves to be of a higher grade." — RINK, *T. and T.*, p. 59.

Among the Central tribes, Tornarsuk is unknown. The most powerful tornaq, a nearly hairless bear, is obtained by going alone to the edge of the land-floe and summoning the bears. A herd approaches: the man is frightened almost to death, but receives one bear as his spirit. — BOAS, p. 592.

The tornguang, or guardian spirit, of the angakoq, may be a person, a bear, a walrus, a loon, a stone, or in fact 'any thing.'

In East Greenland (Angmagsalik) the tornaq is called 'tartaq' (tarne, 'soul'). At the Mackenzie, the Anerneit (literally 'breaths'), the lower spirits able to assume any shape, and the Innulit (literally 'possessing men'), the souls of the dead, 'belong to the totemism or shamanism of the Eskimo.' — PETITOT, p. xxxii.

In Greenland most of the inue ('owners,' 'spirits') of land and sea could be made tornat, and also the souls of qivigtut, of the dead, and of animals.— RINK, *T. and T.*, p. 59.

The breath or soul after death becomes a tornguang. The tornat, accordingly, live in the air, between heaven and earth. The relation of the tornguang to the Torngaxssung is not very definite. The same person once spoke of several Torngaxssut, once called him the oldest tornguang, at another time called him an old angakoq. He has power over the tornat, but does not seem to be radically distinct from them. (The word 'tornarsuk' means, according to Kleinschmidt, 'peculiar, separate tornaq'). Nor is there necessarily only one Torngaxssuk. He is also

described as a dead person, who is often heard whistling (thus : — —, or — ⌣ —) when persons are alone, who are then much frightened, though at later times the recollection of fright causes amusement. An angakoq, on such occasions, can see as well as hear Torngaxssung.

In Greenland, Tornarsuk was apparently regarded more as an individual. But conceptions of him were vague. "Some say he has no shape; others describe him as a great bear, or a large man with one arm, or as being of the size of a finger." — CRANZ, p. 264.

In East Greenland every angakoq has his own Tornarsuk, who lives in the sea, and with whom he communicates by his Aperketek. He is as long as a large seal, but stouter; but his anterior flippers are as long as a man's arm. He swims rapidly at the bottom of the sea, and is visible to others besides angakut. He answers questions put to him by the angakoq, and devours stolen souls. — *Résumé*, p. 374.

The Central and Mackenzie tribes know the tornaq, but not Tornarsuk. Among the latter, Anerné-aluk (Esprit-Grand) is "vague and imperfectly conceived, but nevertheless real;" as he is not harmful, he is regarded with indifference, as in Greenland Tornarsuk. [Anerné-aluk seems to mean 'large or bad spirit.'] . . . At the Mackenzie the souls of the dead (innulit) whistle and cause fright. — PETITOT, pp. xxx., xxxiii.

The boy Minik, ten years old, used 'torngang' and 'torn, gaxssung' synonymously. He also called the ghost of a dead person 'torngaxssung.' According to him, if a person sees a torngang, he dies immediately. Thus it is said that two men were once hunting seals through the ice, waiting for them to come to the blow-hole. They were sitting at a little distance from each other, when suddenly a torngaxssuk came up through one of the holes, and the man fell down dead at once. It is told that a woman who had died could not be lifted from the ground and that this was caused by torngaxssuin. When the name of a dead person is mentioned, torngaxssuin come about the house at night, making various noises about the entrance. If, however, dogs see them, they bark at them, and thus drive them away.

The angakoq uses his tornguang as an instrument for almost every purpose, and it is in possessing a tornguang that all his angakoq power seems, directly or indirectly, to lie. By means of his tornguang he discovers whether a sick person will recover; by it or on it he can fly to the moon and back; to it he prays and sings. He can summon it at any time, and it is only to him that

it is visible. Whether other angakut can see his tornguang is not clear.

The powers of the angakut are manifold and of various degrees. Ross (p. 128) says that it is in their power to raise a storm or make a calm, and to drive off seals or bring them in. Some are much more powerful and wise than others. There do not seem to be any contests for superiority among them, as in Greenland (see the tale in RINK, *T. and T.*, p. 459), since the weaker recognize the others as stronger. The best are those that can go up to the sky, or qeleliarqtarqton (*cf.* BOAS, p. 598; RINK, *T. and T.*, p. 440). Besides, they can walk on clouds (ilumakpakton; Greenland, ilimarneq, 'spirit-flight;' *cf.* RINK, *T. and T.*, p. 271), and over (not on) the water, going up and down with the waves, near the surface. They can cure people who are sick, or, if their case is hopeless, predict that they will die. A good angakoq can also see disposition and character. Thus Qumunapik knew that several individuals at Smith Sound were inclined to commit murder, as well as the Adlet from whom he had come. The angakoq, if there is a scarcity of seals, can bring them by going to the dead angakut (siudleratuin), who cause the seals to return. Or he goes down to Nerivik, the woman under the sea, and, by combing and braiding her tangled hair, secures from her the release of the seals.

In Greenland the visiting angakoq frees Arnarquagssaq from the parasites (agdlerutit, 'abortions') fastened around her head, and thus induces her to release the seals (RINK, *T. and T.*, p. 40), the parasites being the charm that restrains the seals (CRANZ, p. 265). In Angmagsalik he combs the seals and narwhals out of the hair of the huge woman (*Résumé*, p. 373). In Baffin Land they are released by the angakoq's depriving their mistress of a charm (BOAS, p. 587; *cf.* also RINK, *T. and T.*, p. 324).

In the United States, the Smith Sound Eskimo say, the angakoq has no power, because there are no tornat. However, they relate a story of what the angakut formerly did. The siudleratuin (people now dead) went into a house that was dark, and had their feet tied together, and their hands behind their back. They then untied their bound hands themselves, cut off their tongue, held it in their hand, and showed it to the spectators. The tongue did not bleed. This, however, is not done now.

This, excepting the mutilation, was actually practised in Greenland (Rink, *T. and T.*, p. 61 ; Cranz, p. 270) and in Baffin Land (Boas, p. 594).

The angakoq also uses his tornguang in curing sickness. A sick person who has no faith in the angakoq is made worse by him until he is terrified into belief ; then the angakoq cures him. The patient must not cut meat, and must follow the other instructions of the angakoq, if he wishes to recover. When performing a cure, the angakoq stands by the sick person, and summons his tornguang. The latter enters the house, but in a dark corner where he cannot be seen. He is, however, heard (*cf.* Cranz, p. 270 ; Boas, p. 593). Only the angakoq may speak or sing to him, since, if any one else addressed him, he would at once disappear. The angakoq speaks to his tornguang, who performs the cure by recovering the departed soul of the patient.

In Greenland the soul could be recovered, exchanged, or repaired (Cranz, p. 257). In Angmagsalik, sickness is caused by the removal, by an angakoq, of the soul, or one of the souls ; the cure consists in its restoration by another angakoq (*Résumé*, p. 373 ; *cf.* the tales in Rink, *T. and T.*, p. 268).

In ceremonies the angakut use the 'angakoq language.' This consists of fifty or a hundred metaphorical, descriptive, obsolete, or mutilated terms, used instead of the ordinary words. Though generally known completely only to the older people of the tribe, it is in no way regarded as a secret, as under certain observances (aglirtun) every one must use the angakoq words (see p. 313). A list of angakoq words is given in the appendix.

Though man or woman, old or young, may become angakoq, only persons born with the necessary gift, endowed with the 'supernatural' faculty, can become angakoq. This is essential. No amount of skill, knowledge, judgment, or wisdom, will make up for it. The Eskimo themselves distinguish clearly between these faculties and the angakoq's power. They say that persons are born angakut.

As to ilisineq, or kusuineq ('witchcraft' or 'sorcery,' as opposed to the legitimate angakuneq), it was impossible to obtain any information. This may be due merely to reticence of the natives ; but it seems possible that, as among the Baffin Land tribes (Boas, p. 595), it does not exist. At any rate, the references to it

found in Greenland tales (*cf.* RINK, *T. and T.*, Nos. 2, 22, 24, 32, 43, 48, 57, 69) are wanting in Smith Sound tales. The word 'tupilak' (in Greenland and East Greenland an artificial animal manufactured to cause the death of an enemy) is, however, known, though all that was ascertainable regarding it was, that it had associations of evil. The wide difference between ilisineq and angakuneq is clearly brought out by Rink (*T. and T.*, pp. 41, 42) and in Holm's account of Angmagsalik, where the ilisineq seems to have become even more important than the angakuneq.

Amulets (arngwan) are worn only by men, either on the back or on the tip of the hood. Pieces of charred wood are used. Charred moss from the lamps is put on the lash of the whip to keep it from flying off when the whip is cracked.

In Baffin Land and Greenland the amulet (armgoaq, arnuaq) seems to have been made most frequently from an animal, though in the former country a piece of the first gown worn by a child is particularly efficacious.

Every person has, in addition to his body, aningnin (breath),[1] angiyang, and aqa (his name). Of these, the aningnin (Greenland, anerneq) corresponds most nearly to our 'life' or 'soul.' When a person dies, the breath leaves him and stays near the body. It seems to be this aningnin which becomes a tornguang after death. It is visible to an angakoq. It has the power of leaving the body; for in curing sickness the angakoq sends his tornguang to bring back the aningnin of the patient. An angakoq can foretell a death by seeing the breath leave the body. When an angakoq dies, his tornguang is heard afterwards, but it is not clear whether this refers to his aningnin now become a tornguang, or to the tornguang he owned.

In Greenland a dead angakoq was apt to re-appear in the shape of a ghost (RINK, *T. and T.*, p. 62). There were two souls, — the breath and the shadow (CRANZ, p. 257).

In Angmagsalik a man consists of body, 'souls,' and name (atekata). The souls are many. The largest live in the throat and in the left side, and are small men, of the size of a sparrow. The others live in all other parts of the body, and are of the size of a finger-joint. When the angakut takes away one, the part of the body thus deprived becomes sick, and it must be restored, or the man dies. — *Résumé*, p. 373.

[1] This disproves Rink's belief (*Eskimo Tribes*, I, p. 88) that the application of this word to spiritual actions and the soul was imported by white men.

The angiyang is described as a bird, visible only to the angakoq. It causes sickness. Wherever a person has pain, the angiyang is pricking him with its bill. When a person is about to die, the angakoq kills the angiyang, and the sick person recovers. When a person dies, the angiyang dies too, after a while. It also informs the angakoq when one has disobeyed his orders, or refuses to tell him the truth. Its evil nature is clear. While the aningnin is bound up with life, the angiyang is opposed to it; its activity causes sickness, its death brings life.

Unknown among the Central tribes, the angiaq in Greenland is an abortion or murdered child changed into an evil spirit.— RINK, *T. and T.*, p. 45. [The affinity to soul is evident.]

A person's name is regarded as 'bad' after his death. It goes out doors into the surrounding air (sila). The name of the dead is never spoken, according to Peary (p. 507), and any other members of the tribe of the same name must assume another until the arrival of an infant to which the name can be applied removes the ban. There are, among the 253 individuals of the tribe, 185 different names. The greatest number of the same name is four.

In Angmagsalik the atekata ('name') is as large as a man, and enters the infant when, after birth, it is rubbed about the mouth with water, while the names of the dead after whom it is named are pronounced. After death the name remains near the body until it is given to an infant, in whom it then continues its existence. — *Résumé*, p. 373.

If the name of a dead person is also the name of some object, this object is not spoken of for some time following. The dead person is not even alluded to, if it can be avoided. Children are named, however, after the person last dying in the neighborhood, or especially the grandparents. The same name is not used for both sexes.

On Davis Strait the infant is always named after the persons who have died since the last birth took place. If a relative dies while the child is younger than four years or so, his name is added to the old ones, and becomes the proper name by which it is called. — BOAS, p. 612.

In Greenland the child was named after a deceased relative, especially a grandparent. — RINK, *T. and T.*, p. 54.

In East Greenland the prohibition against using the name of the dead is

more permanent than at Smith Sound. The word drops out of the language, and is replaced by a circumlocution, a derivative, or a synonyme, so that the language is considerably modified by this process. It is supposed, however, that the old names revive when the dead person is forgotten. — *Résumé*, p. 372.

Ideas as to life after death are vague and conflicting. There are three places to which the dead go, — aningan ('moon'), adlirqpat ('the lowest place,' the habitation of Nerivik, under the sea), and sila ('outside,' the atmosphere). What classes of people go to each of these places is not said (except that women who die in childbirth go down to Nerivik). Questions bring only contradictory statements. There seems to be no conception of the dead having any definite occupation, or of any more or less pleasant state in the various places, or of any reward or punishment. What it is that goes to these places is also not clear. The angiyang dies, while the aningnin ('breath') is expressly stated to remain near the body for some time at least, and becomes a tornguang, which inhabits the air (sila). Mrs. Peary states (p. 187) that on her husband's return from the inland ice-cap (serngmeng) he was regarded as a spirit, and later asked about the spirits of the dead.

In East Greenland the dead go either to the sea or the sky. They fare well in both places; but the lower is preferable. — *Résumé*, p. 373.

In Greenland, opinions are contradictory; but on the whole the lower world is preferred, being warmer, and richer in food. The inhabitants of the upper world cause the aurora borealis by playing ball with a walrus-head. The journey to the lower world is dangerous and difficult, the soul having to slide from a rough rock for five days. During this journey it may perish through stormy weather, or through violation of mourning customs by the relatives; and this is called 'the other death,' which is feared extremely. The journey to the upper world is quick and easy. — CRANZ, p. 258.

Among the Central Eskimo, heaven is the pleasant land; the lower world is dark, cold, and stormy. The Adlivun are below the sea, the Adliparmiut the lowest; similarly Qudlivun ('those above') and Qudliparmiut ('the highest'). Some tribes know of four lower worlds, only the lowest being pleasant. Both here and in Greenland the meritorious (drowned hunters, women dying in childbirth, etc.) go to the happy land. — BOAS, p. 589.

At the Mackenzie the dead inhabit the bottom of the sea. They dance, and play ball, and 'hold communication with immortal beings clothed in scales.' — PETITOT, p. xxxii.

The dead and all belonging to them are regarded with fear, and the survivors are for some time in a state of panic. Peary

speaks of a woman (p. 408) who dreamed of seeing a deceased woman, and all were in terror the next day. He also states (p. 227) that on the death of a woman at Narksami (Naqsaq), the natives all removed to Netiulumi (Natilivik). Formerly people sometimes starved to death, but now they put food on the graves, and are exempt from famine. Even among the christianized Eskimo of southern Labrador, putting food on graves that have been dreamed of causes a good hunt. The same custom is described by Boas (p. 614) among the Central tribes.

When a person is dying, he is removed from the house, when possible. If, however, he should die in the house, the body is removed, — if a man's, through the door ; if a woman's, through the window. Sometimes also, if the person was disliked, the corpse is left. In that case, the house in which he died is demolished, the best stones being used for a new house. Generally, however, the corpse is buried. The mode of burial is as follows : A hood is put on the corpse. It is then carried on the back to the burial-place of the settlement, which is not far away, the corpses being laid down next to each other with their heads away from the sea. The body is then surrounded by stones, and covered with flat slabs.

Arctic explorers give the following descriptions of burials at Smith Sound : —

"The woman died at five ; at six she was sewed up in a seal-skin winding-sheet, and carried on a sledge to a neighboring gorge, and there buried among the rocks, and covered with heavy stones. The only evidences of sorrow were shown by her daughter Merkut. Merkut remained by the grave after the others had departed ; and for about an hour she walked around and around it, muttering in a low voice some praises of the deceased. At the head of the grave she then placed the knife, needles, and sinew which her mother had recently been using, and the last rites were performed."— HAYES, p. 294.

"The body was enveloped in skins, carried away on a sledge, and buried in the snow with his face turned to the west. After the body was covered, the sledge was turned over it, and the hunting implements of the dead man laid next to it. The men hereupon put a small bunch of hay into their right nostril, the women into the left. These were worn several days, and laid aside

only when a house was entered."—BESSELS, p. 369. [Bessels adds that it is customary, snow and weather permitting, to cover the body with stones.]

"On the death of a man or woman, the body, fully dressed, is laid straight upon its back, on a skin or two, and some extra articles of clothing placed upon it. It is then covered with another skin, and the whole covered in with a low stone structure. A lamp with some blubber is placed close to the grave; and, if the deceased is a man, his sledge and kayak, with his weapons and implements, are placed close by, and his favorite dogs, harnessed and attached to the sledge, are strangled to accompany him. If a woman, her cooking-utensils and drying-frame are placed beside the grave. If she has a dog, it is strangled to accompany her; and, if she has a baby in her hood, it too must die with her. If the death takes place in a tent, the poles are removed, allowing it to settle down over the site, and it is never used again; if in a house, it is vacated, and not used for a long time."—PEARY, p. 506.

"Her body was sewed up in skins, not in a sitting posture, like the remains which we found in the graves at the south, but with the limbs extended at full length; and her husband bore her unattended to the resting-place, and covered her, stone by stone, with a rude monumental cairn. The blubber-lamp was kept burning outside the hut while the solitary funeral was in progress; and when it was over, the mourners came together to weep and howl, while the widower recited his sorrows and her praises."—KANE, p. 118.

In Greenland the body is removed through the window, and carried or dragged to the burial-place. Among the Central tribes, the dying person is removed from the house or tent, as his death in it would render it uninhabitable. In East Greenland the body is dragged through the door or window, and thrown into the sea, if any of the ancestors of the dead have perished while kayaking, which is now always the case; formerly it was buried.

After a death, the survivors are aglirtun (Greenland, agdlertut), under certain restrictions or taboos.[1] Only relatives who lived with the deceased are affected by this observance. There are two periods. The first lasts for five days after the burial. (In

[1] For detailed accounts of these regulations and ceremonies elsewhere, which are numerous and generally similar to those here mentioned, see Rink, T. and T., pp. 54, 55, and Boas, pp. 614, 615.

Greenland, during the five days that the soul is sliding down a rough rock to the lower world, the relatives of the dead, to prevent injury to the soul, must do no work, and refrain from certain food, etc.) The relatives do not leave the house in this time, and do no work of any kind, nor may children play. After this comes another period of less severe mourning, said once to last until the sun goes away or comes back again, at another time three months. There are again certain restrictions as to work, carrying water being especially forbidden. Nothing may be carved or manufactured. The aglirtun may not go outdoors, unless completely dressed, *i. e.*, wearing a hood. Certain kinds of meat — bear, fox, and especially ground-seal — may not be eaten. It is noteworthy that the ground-seal is the only sea-mammal which did not originate from the fingers of Nerivik, and is not eaten by the dead staying with her. "Nanon aglerin, uxssung aglerin, nanon pidlessevatit," is a mnemonic formula for this provision: "Refrain from bear, refrain from ground-seal, the bear will do you an injury." (Among the Central tribes the walrus takes the place of the ground-seal in this respect.) According to Kane, the bereaved may be required (by the angakoq) "even to abstain from the seal or walrus hunt for the whole year, from Okiakŭt to Okiakut (winter to winter). More generally he is denied the luxury of some article of food, as the rabbit, or the favorite part of the walrus; or he may be forbidden to throw back his nessak, and forced to go with uncovered head." During the first period of mourning, grass or moss is put into the nostrils when the aglirtun go outdoors. The aglirtún must also use 'angakoq words;' *i. e.*, the jargon, or 'official language,' of the angakut (see p. 307). Instead of siglalik, the angakoq word for aveq, 'walrus,' they use, however, iloung. Aglirton is also said of a menstruating woman. She is under the same restrictions as after a death,—she must wear a hood outdoors, may not carry water, may not eat the prescribed kinds of food. She also eats from her own plate, apart from the others.

The following observations as to the practices of the Smith Sound aglirtun, secured by Dr. Boas from an attendant (speaking Eskimo) of the party in this city, are exceptionally full, though perhaps the customs are somewhat modified by the unusual surroundings.

"When informed that his wife was dying, Nuktan picked her up and carried her out of the house into the barn. Once before, when her death was expected, he ordered her to be carried out of the house, and, putting on his hat and coat, prepared to accompany her. When informed she was dead, he asked whether she was still breathing, or quite dead. When sure of the latter, he prepared to see her. He put on fresh underclothes, dressed fully, putting on coat, hat, and gloves, and asked for a cord, which he tied below his hips, outside his trousers. He also stuffed his left nostril with paper, and, taking hold of his coat on both sides, walked out to the corpse. He was followed by his adopted daughter; and Ujaragapssuq, his son-in-law, brought up the rear.

"When they entered the room in which the corpse was, Nuktan began to talk to the body, speaking fast and in a very low voice, and using many unusual expressions. After a while he approached her (he had talked to her from a little distance at first). With one hand he lifted up the blanket covering her, and passed his other over her body from her forehead to her heart. Then he took her by the shoulder, and shook her hard, telling her to remain where she was. He also spat on her forehead three times, telling her to wash herself. Among other things that he said to her were the following: He ordered her to stay where she was until he took her away. He reproached her with being an angakok and not being able to cure herself, and added, 'I am sure I shall die myself.' He said to her that, if there were anything she desired, she should appear to him at night in his dreams, and he would satisfy her, but that she should not come near him at other times. He ordered her to stay where she was buried, and to trouble no one, nor to follow him when he was kayaking. This injunction, to remain where she was, he repeated a number of times. He also ordered her to prevent bad, and make pleasant, weather. Finally they left the room. The others went out first, and then he followed, going backward until he was outside the door.

"For the next five days, Nuktan did not leave the house. For the first two days of this period he kept the paper in his nostril continually, except when eating. He wore his hat and coat all the time, and did not move about. For two nights he sat up in

bed after the others were asleep, talking. After these two days, when informed that his wife had been buried, he no longer wore his hat, except when he was moving about. He also did not wear the paper in his nostril as continually as before, but still wore it until five days had elapsed from the day of the death. During these five days he would not leave his room. He had all his food brought in to him. He demanded his meat rare or raw, only warmed, and would not cut it himself. He also asked that his eggs be broken for him. He drank no tea or coffee, but only water. This he did not get himself, but had it given to him, and then let it stand until it was lukewarm. He wanted his cup kept apart from the rest, and used neither knife nor spoon, but only a fork.

"After these five days, the mourning observances were less strict. Early on the next morning, before sunrise, he left the house with his daughter, after having been satisfied on the previous day that the body had been taken away. He wore the cord he had worn on the day of the death, and as he went out made a scratch on the porch with a short stick, at the place from which he started. Then they walked about the house twice without stopping, keeping it to their left; *i. e.*, going in a course opposite to that of the sun. On returning, he crossed the mark that he had made before.

"On this day also he again broke his eggs himself, particularly asking that it be not done for him. He also desired to take a bath, and washed his body over with a wet rag, not drying himself. From this day he no longer wore the stuffing in his nose.

"The following day he again took a walk exactly like the preceding, except that he did not scratch the marks. A few days later he walked a little farther, — as far as the barn, — and on returning made three scratches on the ground,—two parallel, and another crossing them. He left the stick at this place.

"On the tenth day after the death he was very anxious to see the grave. He said that on the tenth day after the burial the grave was always visited, and again ten days later. He said that this was necessary, and was much troubled at not being able to go. He also asked for a piece of paper with pictures on it, and three needles, for what purpose is not clear.

"Throughout this period the observances were similar to those of the first five days, though less rigorous. Both the men moved

about little, and put on their hats whenever they did. Nuktan went outdoors but rarely, and when he did, wore his gloves. From the time of her death he wore no suspenders. He also refused to have his hair cut. None of the party went outdoors after dark, nor would they move about indoors. When asked to, Nuktan refused to go out at night, saying he could not do so. They all had their own cups, knives, and plates, and were careful to keep them separate. Every third morning, Nuktan would not leave his bedroom, and had his food brought in to him. He had his eggs broken for him, and his meat cut for him (except about once a week?). He would do no work, nor make anything, such as kayak or sleigh models. He said that he would not do this until several months had passed. The young man, on the other hand, was ready to work.

"Before her death, Atangana had requested that, when she was buried, the stones should not be put too close together, for fear that she might not breathe. She did not want to be buried under the sand, and wanted no coffin. She asked, moreover, that no clothes be put on her, except a shirt (?), but no petticoat, and that her face remain uncovered. Nuktan asked whether this had been done, and requested that she be buried as she would have been at home.

"The dead woman was not mentioned: even an allusion to her, without mention of her, excited his disapproval. All her property was either removed or destroyed, at Nuktan's command. He ordered everything to be thrown away or burnt, and her cup and plate to be broken. By accident a part of her dress remained in the room in which she had been, and her husband never entered that room. Ujaragapssuq, however, did not hesitate to enter it.

"When Kissuk died, leaving a son, Minik, about ten years old, and without a mother, Nuktan offered to kill him. Then he gave orders that for five days the boy was not to play. Some time later he insisted that the boy visit the (supposed) grave of his father, and instructed him how to act. He told him what to say at the grave, and gave him some of the deceased's property to lay on the pile of stones. When he saw a photograph of the dead man, he ordered it put away and to be laid down, 'as (because) the dead man is lying.' None of the party were observed to use any angakoq words."

The cosmology and mythology of the Smith Sound Eskimo differ from those of other Eskimo tribes only in detail. Torngaxssung, the head of the spirits, has been mentioned and discussed on p. 303. The submarine female deity known in Greenland as Arnarquagssaq and in the Central Regions as Sedna, Uinigumisuitung, etc., is called 'Nerivik' ('place of food') at Smith Sound. Nerivik is an old woman who lives underground, below the sea, in Adlirqpat ('lowest down'). Some of the dead go to her; so do dogs when they die The dead residing with her eat sea-mammals, but no land-animals and no ground-seals (which are also not eaten by the mourners). When the seals fail to appear, an angakoq visits Nerivik and combs her tangled hair; whereupon she releases the seals, and they come up. The usual myth about this deity (Boas, pp. 583–587; Rink, *Eskimo Tribes*, p. 17) is told in a fragmentary form at Smith Sound (see Journal of American Folk-Lore, XII, p. 179). It is related that she was unwilling to marry; that she began to devour her sleeping parents; that her father took her with him into a boat; and that from her fingers which he chopped off over the gunwale sprang all the sea-mammals (except again the ground-seal). No name is given by the Eskimo to the woman in this tale, but undoubtedly she is or formerly was called Nerivik.

The myths concerning this deity are most ample among the Central Eskimo, and she gradually loses in prominence among more eastern tribes. In Greenland the myth connecting her with the origin of sea-mammals was not mentioned by earlier writers; and even as given by Rink it lacks some of the features still remembered at Smith Sound. In East Greenland, finally, this myth does not seem to occur at all, and the deity herself is altogether nameless. For her attributes in Greenland, see Cranz, p. 264.

Kane and the Pearys mention two mythical figures about which I obtained no information. Kane says (p. 214) that "the walrus, and perhaps the seal also, is under the protective guardianship of a special representative or prototype. They all believe that in the recesses of Force Bay, near a conical peak, a great walrus lives in the hills, and crawls out, when there is no moon, to the edge of a ravine, where he bellows with a voice far more powerful than his fellows out to sea, which brings a good hunt." Both the Pearys speak of Kokoyah, 'the evil spirit,' or 'devil.' He is described as destructive, provoking the barking of dogs, and

in communication with, or under the control of, the angakoq. Kokoyah is probably Torngaxssung, but the giant walrus is not so easily identified with Nerivik.

The Sun (Seqineq) was a girl with a torch pursued by her brother the Moon (Aningān), the myth of all Eskimo tribes (this, with two tales referring to Aningān, has been printed in the Journal of American Folk-Lore, XII, p. 179). The Sun and the Moon now live in the sky, in a double house having but one entrance (qarearing). In one house lives Aningān, with his wife Akoq or Aqong; in the other, Seqineq. In front of the house stands Aningān's sledge piled full of sealskins. He has a number of large spotted dogs, with which he often drives down to the earth.

In Baffin Land the sun lives in the moon's house, in a small additional building (BOAS, p. 598); in Greenland she is still pursued by him (CRANZ, p. 295) as in Labrador (TURNER) and at the Mackenzie. In Baffin Land the moon's mythical name is Aninga ('her brother'); in Greenland, the moon is Anningat or Aningaut, and the sun Malina. In Angmagsalik they are called respectively Ijakak and Sungula. (At Smith Sound, aningān is also the ordinary word for 'moon.') Fabricius gives Agut, Ayut, Aguna, as the name of the sun in Greenland. In Alaska, akychta, akchta, is the sun; igaluk, ialo, iralo, the moon. At the Mackenzie we have the Greenland names, Maligna, Anuya. In Baffin Land the moon has one dog only, Tirietiang, dappled white and red (BOAS, p. 598); in Greenland, one (RINK, *T. and T.*, p. 442) or four (CRANZ, p. 295); in East Greenland, a narwhal draws his sledge, or a single old dog whose skull is not covered with skin (HOLM, *Sagn*, p. 80).

Besides Aningān's wife and sister, he has a cousin, also a woman, Irdlirvirisissong. She lives in the sky, but in a separate house, and sometimes visits Aningān. Her nose is turned up on the sides. She carries a plate called 'qengmerping,' for her dogs, of whom she has a number. She waits for people who die, so that when they come she can feed her dogs on their intestines. She dances about, saying, Qimitiaka nexessaqtaqpaka ('I am looking for food for my dear dogs'). Those of the people that laugh, she cuts open, and gives their entrails to the dogs. Others are spared. Aningān consequently warns the people not to laugh. When an angakoq comes up to visit Aningān, he turns his head aside, so that his laughter may not be seen. If he begins to laugh, Aqoq says, Qongujukpouq ('he laughs'). Irdlirvirisissong goes driving with her dogs.

In Greenland she is called 'Erdlaveersissok' ('the entrail-seizer'). Residing on the way to the moon, she tempts people to laugh by her dancing and grimaces, and if successful takes out their intestines. Aningat assists his visitors not to laugh (RINK, *T. and T.*, pp. 48, 440). At Angmagsalik the sun's mother (Jupiter) cut to pieces a visiting angakoq, and ate his liver. With difficulty he snatched his soul away from her, and escaped (HOLM, *Sagn*, p. 80). In Baffin Land the story is told as in Greenland, except that the woman, who is here the *wife* of the moon, is named U'uliernang. Her back is hollow, and she has no entrails, a circumstance which in Greenland is told of Malina, the sun. Ululiernang gives the entrails she can get to the moon's ermine. Her plate and knife are especially mentioned, as in Greenland (BOAS, p. 598). In Greenland the moon's wife, and his sister the sun, would seem to be identical; in Baffin Land, his wife and the entrail-seizer; at Smith Sound the three are distinct.

An eclipse of the moon is called 'pudlasson' ('glide in,' 'visit;' Alaska, pudlaru, 'eclipse'); and the moon is said to have gone to defecate. An eclipse is considered bad, and feared, though for no definite reason (*cf.* CRANZ, p. 295).

Thunder (kagdleq, kadlu) is unknown, and there is no myth concerning it. Neither is there any myth about the aurora borealis (CRANZ, pp. 195, 260; BOAS, p. 600; MURDOCH, *American Naturalist*, 1886, p. 595; RINK, *T. and T.*, p. 37). The story of a flood — found in Greenland, Baffin Land, and at the Mackenzie River — is also unknown (BOAS, p. 637; PETITOT; RINK, *T. and T.*, p. 38; CRANZ, p. 262).

The Pleiades were once a number of dogs pursuing a bear on the ice. The bear gradually rose up in the air, as did the dogs, until they reached the sky. Then they were turned into stars. The constellation is called 'Nanuq' ('Bear'). The Bear is still pointed out as a larger star in the centre of the cluster. The star Naulaxssaqton was once a seal-hunter. Peary says that the Great Dipper (Tooktoksue) is the head of a caribou; Cassiopeia (Pitoohen), the three stones supporting a lamp; the Pleiades, dogs and a bear; the three stars of Orion's belt, steps cut in a steep snowbank; Gemini, two stones at a house entrance; Arcturus and Aldebaran, personifications.

Ursa major is a caribou in Alaska, Central Regions, Smith Sound, and Greenland; only in Angmagsalik is it lamp stones. The dogs and bears, which in Angmagsalik, Greenland, and Smith Sound form the Pleiades, in Labrador and the Central Regions are transferred to Orion.

The following are among the fabulous beings or races.

Qalútaling is a woman who lives at the bottom of the sea. She says, 'Psh, psh, psh!' (the *sh* is pronounced through one corner of the mouth, and is prolonged). She can be heard, but not seen, by men. She is also known as 'Amautiling' ('having a hood'), and can carry men in her hood.

Among the Central Eskimo, Kalopaling or Mitiling puts drowned hunters in his hood. He lives in the sea, and can only cry, 'Be, be! be, be!' (BOAS, p. 620).

Uissa is a dwarf, who lives or is seen on the ice.

According to Boas (p. 620), the Uissuit are a deep-sea dwarf people, among the Central tribes.

The Igluwayut live in large stones.

In Baffin Land Igdlungayut are a bandy-legged inland people (BOAS, p. 640).

Tutuatuina has tangled hair, and lives underground.

The Tornit, plural of 'tunirng' (in Greenland, a fabulous inland tribe; in Labrador and Baffin Land, semi-fabulous, semi-historical: RINK, *T. and T.*, pp. 47, 469, and BOAS, pp. 634, 640), are large, live in the ground, where they have houses (igluling), and are afraid of dogs. They sometimes have intercourse with men. Peary says (p. 397) that in the north men are supposed to live who are so large that they wear coats of ground-seal.

The Adlet live in Akiliniq, a distant fabulous country across the sea. The Eskimo living west of Smith Sound are known by this name, and there seems to be more or less confounding of the fabulous and the actual tribe.

In Labrador Allak, Aullak, is an Indian; Baffin Land, Adla, Adlet, dog-man; Greenland, Atdlit, a noseless subterranean tribe. In northern Baffin Land, Greenland, and Angmagsalik, the dog-men are called 'Erqigdlit' (RINK, *T. and T.*, pp. 46, 47; BOAS, p. 640).

Nakassungnaitut are descended from the woman who mated with a dog.

The Inugaudli'gat are very small in size.

In Greenland the Inuarutdligat are dwarfs with magic shooting weapons (RINK, *T. and T.*, p. 47); in the Central Regions the Inuarudligat are dwarfs living in the cliffs near the shore (BOAS, p. 640).

Qogluviya is a large worm or serpent.

In Greenland qugdlugiaq is an enormous worm with many feet and great speed (RINK, *T. and T.*, p. 48).

The Smith Sound Eskimo have generally been regarded not only as distinct and differing from those of Greenland, but as probably forming part, ethnologically, of the group of tribes known as the Central Eskimo. It will be clear from the foregoing pages, and without further discussion of the comparative references there made, that there is little ground for the latter assumption. What we can conclude from the material presented is that the Smith Sound Eskimo ethnologically resemble both their neighbors, the Greenland and the Central Eskimo, in such a way that they stand between them and form a transition between them (just as they are geographically intermediate) ; but that if they are more closely related to one than the other, that one is the Greenland tribe. The tales of the Smith Sound Eskimo (Journal of American Folk-Lore, XII, p. 166), of which about the same number recur in Baffin Land and Greenland, show this intermediate position. The language too, which it is impossible to discuss further here, confirms this conclusion, while at the same time it seems to demonstrate a closer similarity of Smith Sound to Greenland than to Baffin Land.

The theory (HOLM, *Ethnol. Skizze*, p. 111) that the Angmagsalingmiut (East Greenlanders) reached their present abode from their presumed western original seat not by way of West and South Greenland but by following the ice-bound and now uninhabited shores of northern and eastern Greenland, seems no longer tenable. If this theory were true, the East Greenlanders would show close similarity to the Smith Sound natives, for they would have entered Greenland at Smith Sound, and the inhabitants there would have been the last tribe they were in contact with. Some similarity there is, of course, between the Smith Sound and Angmagsalik tribes, — as there is between all Eskimo tribes, even the most distant ; but this similarity is much less than the resemblance of either of the two tribes to the intermediate Greenlanders of the West Coast. Thus the chain of ethnic relationship (and apparently the line of migration also) of the eastern Eskimo is : Central Regions, Smith Sound, West Greenland, East Greenland.

APPENDIX.

The following list of Angakoq words, or words used by the shaman in religious ceremony, is believed to be complete for the Eskimo race, as far as present material allows. The Greenland words are taken from H. Rink, The Eskimo Tribes, II, p. 96, and come originally from Egede and Fabricius. The Central and Alaskan words were obtained by Dr. F. Boas from the Eskimo of Baffin Land and of Port Clarence, Alaska, respectively. The Angakoq words, which are printed throughout in italics, are arranged under headings according to their significance. The English word is followed by the corresponding Eskimo word in ordinary speech. Under this are put the Angakoq words in the several dialects, so far as known. These again may be followed by one or more cognate or similar words of the ordinary language, which are given because they seem to throw light upon the Angakoq words. The Eskimo dialects are designated as follows: Greenland, G.; East Greenland, Ge.; Smith Sound, S.; Labrador, L.; Central Regions, C.; Mackenzie Delta, M.; Alaska, A.

COMPARATIVE VOCABULARY OF ANGAKOQ LANGUAGE.

A. Animals.

Polar bear, nanuq. — S. *ájapaktoq;* C. *uxsoarēdlik* [having fat]; A. *kigutilik* [having teeth].

Wolf, amaroq. — C. *singáqte* [with red mouth]; A. *kajūpteliq.*

Caribou, tukto. — G. *komaruak, tatdlanginik* [see Whale]; S. *kumaroá;* C. *qilikailiqdjuaq, qangiling* [having a top?]; A. *qumaxóak, tukidlik.* [*cf.* G. kumak, louse.]

Hare, ukaleq. — S. *kumagoaitiaq* [*cf.* Caribou].

Dog, qingmeq. — G. *punguaq;* S. *pungváq;* C. *pungnu;* A. *qingmik.*

Fox, S. teriangniaq, M. pichukte, A. pisuka'rsuq. — S. *pissukaitiaq;* C. *pisuqáng* [*cf.* M. and A.]; A. *pamiedlik* [having a tail].

WALRUS, auveq. — S. *ssiglálik, iloung ;* C. *tiktlárlik ;* A. *tugadlik* [having tusks]. [*cf.* G. sigdlaq, stick for pushing or lifting ; -lik, having.]

HARP SEAL (Phoca grœnlandica), ataq, C. qairolik. — C. *ataq.*

RINGED SEAL (Phoca fœtida), natseq. — S. *qajuvaq* [see HARP SEAL] ; C. *angmietiaq.*

GROUND SEAL (Phoca barbata), ugssuk. — S. *mágdlaq ;* C. *māktlaq.* [*cf.* A. magdlaq, large seal.]

WHALE, arfeq, aqbiq. — C. *taitlaníqdjuaq, tatlánirn* [see CARIBOU] ; A. *sarpilik* [having a whale's tail].

NARWHAL, WHITE WHALE, qilaluvaq. — S. *agligva ;* C. *puijáqdjuaq* [large sea mammal]. [*cf.* G. agliqâ, to spot.]

SALMON, eqaluk. — S., C. *mingeriaq* [*cf.* L. mingeriaq, small fish ; G. mingoq, water-beetle].

SEA MAMMAL, SEAL, puisse. — G. *mingneriaq* [see SALMON] ; A. *umidlik* [having a beard].

BIRD, tingmiaq. — C. *kangirtauk* [*cf.* G. kangaterpoq, to rise].

EAGLE, nagtoralik. — G. *ititevigssuaq.*

FALCON, kigssaviarssuk. — G. *qungunārssuk.*

B. PERSONS, TERMS OF RELATIONSHIP, AND ANGAKUNEQ.

CHILD, qiturngaq. — G. *koeitsiak, quaitsakāka ;* S. *qoaiaitiaq ;* A. *mikiqtléa* [*cf.* G. mikivoq, is small].

ORPHAN BOY, iliarssuk. — A. *qoajắk* [see CHILD].

BROTHER, ane. — G. *migdliaq* [navel-string] ; A. *aniaqáta.*

FATHER, angutâ, atáta. — G. *negovia* [his origin] ; A. *pőuk* [bag, see MOTHER].

MOTHER, arnâ, anána. — G., S., A. *pőuga* [my bag].

HUSBAND, MY, uiga. — A. *angutaúnra* [*cf.* angut, man].

WIFE, MY, nuliaga. — A. *senídliē* [worker].

ELDER BROTHER, said by a woman, arqaluaq. — S. *nugapia* [bachelor].

MAN, angut. — G. *niviarsiaraq* [girl] ; S. *niviaxssia* [virgin] ; A. *qilamā* [*cf.* G. qilavoq, practise sorcery].

WOMAN, arnak. — G. *kópalik* [see GIRL] ; A. *nuliésiaq* [*cf.* G. nuliaq, wife].

GIRL, niviarsiaraq. — G. *nukakpiak* [young man ; see ELDER BROTHER] ; A. *qopasíak* [see WOMAN].

CRYING CHILD, S. qiasson. — S. *angasson* [*cf.* G. angavoq, sit disheartened and bent].

HUMAN BEING, inuk. — G. *taursak* [see SOUL]; A. *tőrnak* [spirit].

EUROPEANS, A. neloarmiut. — A. *tanguit* [*cf.* A., other dialects, tanguit, Europeans].

SHAMAN, angakoq. — G. *kannimavoq*, he is an angakoq; A. *qilédlik* [possessing a spirit].

SPIRIT CONTROLLED BY SHAMAN, tornaq, tornguang. — A. *qilétga* [my spirit; see MAN]. [*cf.* G. qilavoq, he practises sorcery.]

SUMMON HIS SPIRIT, G. *sarkomersárpoq*.

THE SPIRIT EXPLAINS THE WORDS OF TORNARSUK, G. *surdlortâlerpoq*.

REPAIR A SOUL, G. *tarnilerpoq* [G. tarne, soul].

INFECTED BY THE DEAD, G. *pyorpok, pyoarpok*.

SOUL, tarne. — G. *tár'ak* [see HUMAN BEING].

C. PARTS AND FUNCTIONS OF THE BODY.

SALIVA, nuak. — G. *ajarak*.

BLOOD, auk. — S. *kanung;* A. *uivinjiqtoq* [*cf.* A. kannik, heart].

VEIN, BLOOD IN THE BODY, A. *tōumasungűyuq*.

HEART, umat. — S. *tigdliqtá* [pulse]; C. *kauktíkak* [made to beat]; A. *iqsaroq* [pit of stomach]. [*cf.* G. tigdleq, pulse.]

EAR, siut. — G. *sudlortâq;* S. *ssudluqtá;* C. *sudlutáq;* A. *nadlautik* [means of listening]. [*cf.* G. suvdloq, tube; nālagpoq, listen.]

EYE, isse. — G. *tékkunaet* [pupil of the eye]; S. *takudnatik* [pupils]; C. *takudnitá* [its pupil]; A. *qingnautik* [*cf.* G. qingnuaq, sunbeam through an opening].

LUNGS, puaq. — S. *publarssiutit;* C. *anirtírbik* [place of breathing]. [*cf.* G. stem po denotes lifting, air; L. publak, air in a body.]

HAND, agssait. — S. *ixsaatin, issaitin;* C. *isaratinik* [*cf.* G. isagpoq, stretch out the arms].

KNEE, síqoq. — C. *audliteik* [travelling].

HEAD, niaqoq. — G. *kaujak;* S. *kangeq* [top of a plant]; C. *kangirtsűak* [large top].

TOOTH, kigut. — C. *tamukuatá* [*cf.* G. tamorpâ, chew].

BONE, sauneq. — S. *ăorvin;* C. *aurivăq* [*cf.* G. aursivik, side of head].

MOUTH, qaneq. — C. *aipalukbiá* [see FOOD, EAT].
INTESTINES, erdlavit, iqáwik.— C. *kingiliqáwik.*
LIVER, tingo. — S. *qariuk* [side extension to a house]; C. *kairak.*
FOOT, isigkat. — G. *tungmatit* [*cf.* G. tungmarpâ, tread on].
KIDNEY, tarto.—C. *tarninga* [its soul].
STOMACH, aqajaroq.—S. *idliviaq* [*cf.* G. igdliaq, uterus].
ABDOMEN, nâq, S. nasseng.—S. *qangatatin* [*cf.* S. qanga, its top].
NAVEL, kalaseq.—S. *miklianga* [his navel-string; see BROTHER].
TUSK, tûgâq.—S. *nujá* [its hair].
DIE, toquvoq.—G. *kardlomeitsok* [having lost the power of speech]; S. *tunuáqtoq;* A. *izukártoq* [fall through hole]. [*cf.* G. tunu, back.]
SICK, A. kéqsirtoq.—A. *nangitoq.*
HEADACHE, G. *kagardlugpok* [*cf.* G. kakagpâ, carry on the head; -lugpoq, bad].
SLEEP, sinigpoq.—S. *qussaussoq.*
EAT, FOOD, nerivoq, neqe.—G. *aipakpoq, aipat, aipatiksak;* S. *aipatoq;* C. *aipat;* A. *kuidlasoq.*
PREGNANT, nârtuvoq.—S. *qinirnmixson* [swelling].
A CHILD IS BORN, ilatârpoq.—S. *qisserqton.*
HE IS BORN (?), S. anerxesson.—S. *piglirton.*

D. IMPLEMENTS AND ARTICLES MANUFACTURED BY MAN.

HOUSE, igdlo.—G. *innerdlak, innerak;* S. *nublík;* C. *nūbik;* A. *nujvik* [*cf.* G. ine, habitation; nupoq, change habitation].
POT, POT-STONE, uvkusik, uvkusigssaq.—G. *outsersût;* S. *oxaimang;* C. *utirtsút* [*cf.* G. ūtsivoq, boil; L. ogitorpoq, the pot is full].
POT, C. qimírbik.—C. *ilijírbik.*
POT, qulivsiut.—S. *utirssiut* [see POT above].
BLANKET, qipik.—C. *udlijuviaq* [covering]; A. *aumitit* [*cf.* L. aumit, bedding].
BRUSH UNDER THE BED, C. adlítjen.—C. *siangoat* [*cf.* G. siāngaroq, branches spread out].
FIRE, PYRITES FOR FIRE, ingneq.—S. *ikuma* [*cf.* L. ikkoma, fire].
OPEN BOAT, umiaq.—G. *ingerluk;* S. *puktauroa;* A. *igdlervikjut* [*cf.* G. igdlerpoq, enter the kayak; G. pugtavoq, float on the water; see KAYAK].

KAYAK, qajaq.—G. *aksak ;* S. *puktauroa ;* A. *igdlírun* [see OPEN BOAT].

PADDLE OF BOAT, angun.—A. *saxílaun* [*cf.* L. saqikpā, push].

PADDLE OF KAYAK, pangautik.—A. *saxilaútik* [dual of PADDLE OF BOAT].

HARPOON, unaq.—S. *tikirán ;* A. *angunéun* [*cf.* G. anguvâ, hunt].

KNIFE, saviq.—S. *qeblá ;* A. *kípun* [instrument for cutting crosswise]. [*cf.* G. qivdlerpoq, shine.]

WOMAN'S KNIFE, ulu.—S. *kigleqtun ;* A. *kimadlik* [having handle of woman's knife]. [*cf.* G. kiligpâ, scrape.]

HARNESS, ano.—S. *anoxssua* [large harness].

LINE, ROPE, aglunaq.—G. *ningorak ;* S. *ningoaq* [*cf.* G. ningipâ, he lowers a line].

FLOAT, avataq.—S. *publaling* [having air to float ; see LUNGS, KAYAK].

SLEDGE, qamutik.—S. *sissoa* [*cf.* G. sisuvoq, slide, glide].

THONG OF DOG-TRACES, C. pitung.—C. *kelalűtik* [*cf.* G. qilerpâ, tie with a knot].

AMULET, arnuaq.—S. *nurngnaun.*

DRUM, qilaut, A. saújaq.—G. *iajâq*, verb *iajârpoq ;* A. *iműgaq* [what resounds ; *cf.* G. imigpoq].

DRUMSTICK, kato, A. kasautaq.—A. *qilaúsaq* [G. qilaut, drum].

CLOTHING in general, anoraq.—S. *anugssen.*

MAN'S TROUSERS, S. nanung [lit., bear].—S. *aorvé.*

WOMAN'S BREECHES, qardlik.—C. *akorudjiaq.*

COAT, G. natseq, C. netiq.—C. *adnuksenga.*

KAYAK JACKET, kapitaq.—A. *mingadluk* [see SALMON].

MITTENS, G. ârqatit, A. áqetik.—A. *artlfaq.*

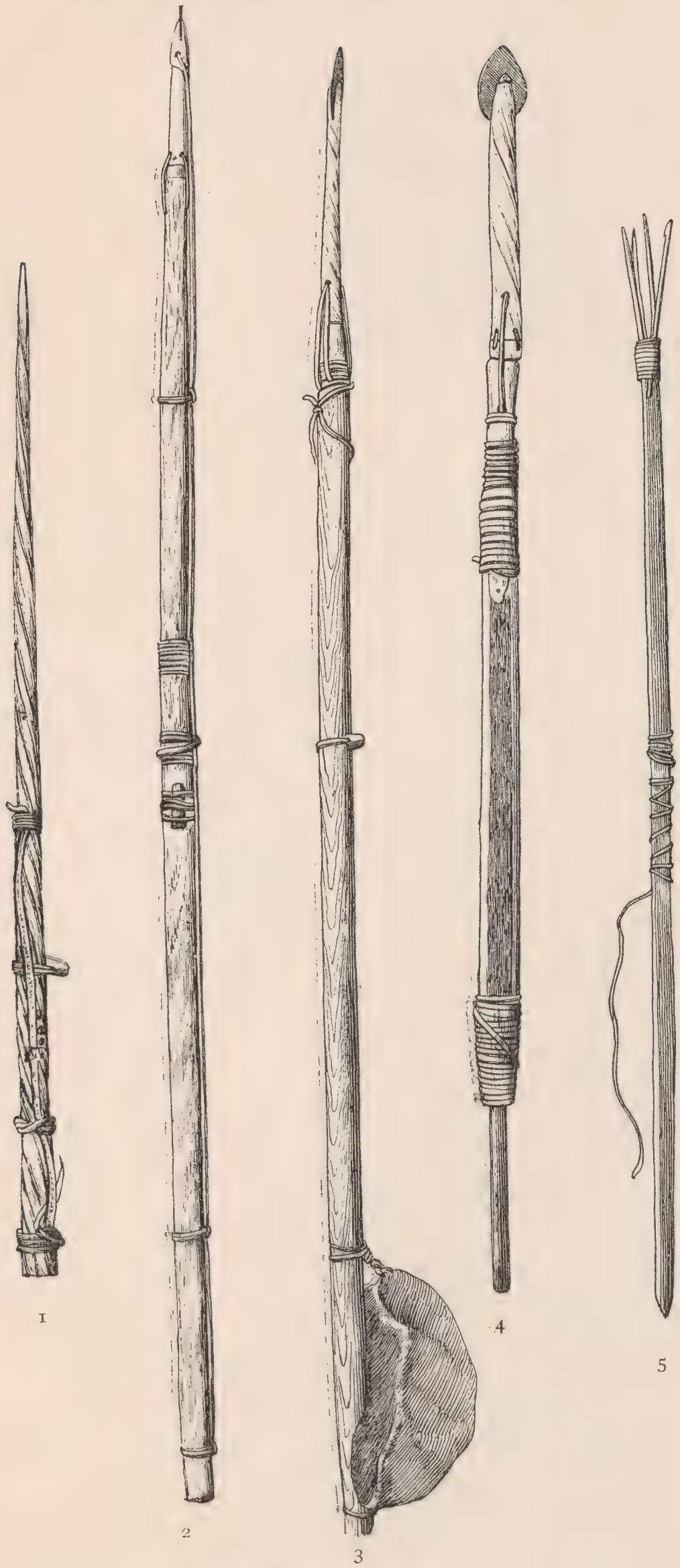
SEALSKIN, qisik.—C. *ixētāk* [*cf.* L. eritāk, skin whose hair is being removed, plucked bird].

DEERSKIN, ameq.—C. *oxometá* [taken in the mouth].

DRIED INTESTINES, inaluaq.—C. *siarvaq* [*cf.* C. sígarpoq, crackle].

E. NATURE.

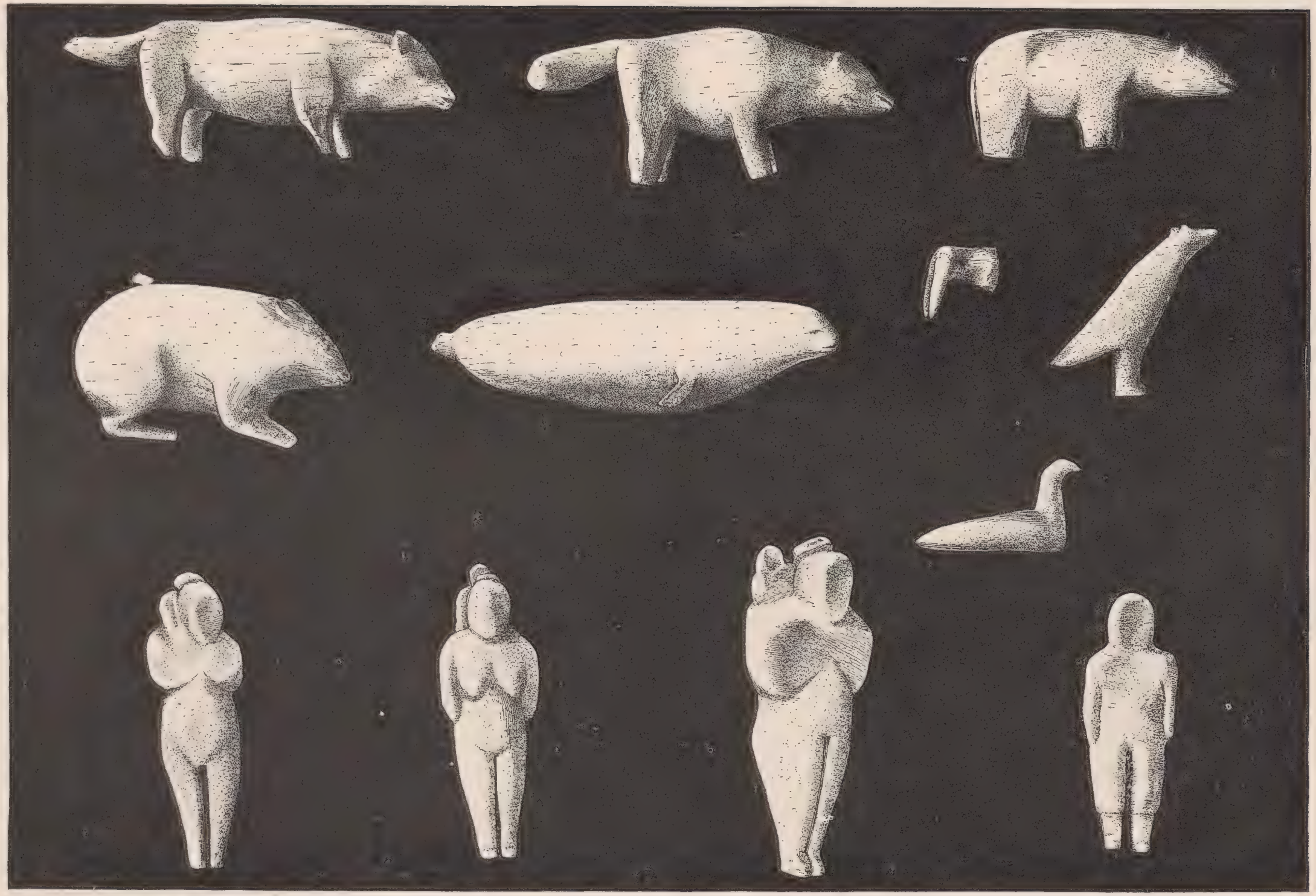
SUN, seqineq.—S. *arngna* [woman], *qāmágun ;* C. *qaumatē*, *qaumativun* [our qaumatē] ; A. *masaq* [known in other Alaskan dialects and Greenland]. [*cf.* Ge. qaúmavaq, sun ; G. qaúmat, moon ; see MOON.]



Figs. 1 ($\frac{60}{134}$), 2 ($\frac{60}{157}$). Harpoons. About $\frac{1}{12}$ nat. size.
Figs. 3 ($\frac{60}{123}$), 4 ($\frac{60}{124}$). Lances. About $\frac{1}{12}$ nat. size.
Fig. 5 ($\frac{60}{998}$). Fish-spear. About $\frac{1}{12}$ nat. size.

MAN IN WINTER COSTUME.

Girl in Summer Costume.



2 Dogs ($\frac{60}{25}$, $\frac{60}{221}$), Polar Bear ($\frac{60}{40}$), Rabbit ($\frac{60}{23}$), Seal ($\frac{60}{219}$), Walrus-head ($\frac{60}{34}$), Sitting Bird ($\frac{60}{25}$), Swimming Bird ($\frac{60}{35}$),
3 Women ($\frac{60}{204}$, $\frac{60}{201}$, $\frac{60}{203}$), Man ($\frac{60}{212}$).

MOON, G. qaúmat, S. aningān, C., A. taqiq.—S. *ajá*, *qāmágun* [same word as "Sun"]; C. *qaumat*, *qaumavun* [our qaumat; see SUN]. [*cf.* G. aja, mother's sister.]

SUMMER, aussaq.—S. *angnaúmĕn* [see SUN, WINTER].

WINTER, ukiuq.—S. *angutaúman* [angut, man; see SUMMER], *kapirdláq* [spring].

AURORA, A. köriet.—A. *tarvit* [place of souls?] [*cf.* G. tarne, soul.]

WIND, anore.—G. *suvdluarnek* [puffing away]; S. *ssubluaqtoq*; A. *sayúqartoq* [G. sujorssuk, noise of the wind].

CLOUD, nuia, A. qilaídlaq.—A. *siléluktoq* [*cf.* G. sialuk, rain].

SALT WATER, SEA, tarajoq.—A. *imaq* [G. imaq, ocean].

WATER, imeq.—G. *akítsoq*; S. *agetóq* [aqipoq, soft]; A. *sinaq* [*cf.* G. sina, edge].

LAND, nuna.—G. *tarsoak* [great darkness]; S. *nunaga* [my land]; A. *tâpqaq*.

SNOW, aput.—G. *anigovirkssuaq*; S. *aniong* [*cf.* A. aniok, anigo, snow].

ICE, siko.—G. *nillakorsoak* [great morsel of ice]; S. *uluxssa* [ule, covering layer]; A. *tŏuaq*, *kitliq*.

ICEBERG, iluliaq.—S. *piqalújaq* [*cf.* L., C. pikadlujang, iceberg].

STONE, ujaraq.—G. *mangersoak* [great hardness]; S. *māngĭq*, *mangjaq* [hard]; A. *sĭmaq* [known in other A. dialects], *qadluk*.

MOUNTAIN, qaqaq.—G. *ingirksoit* [*cf.* G. ingik, point, top].

FJORD, kangerdluk.—G. *abloriak* [*cf.* G. avdlorpoq, stride].

NORTH, ava.—G. *tâk*, *tarrup tungâ* [dark, direction of dark]. [*cf.* S. taxaq, north.]

SOUTH, qava.—G. *kaumatib tungâ* [direction of light].

AIR, sila.—G. *nyovik*.

PLANT, ROOT, G. *tarsoarmio* [inhabitant of the great darkness].

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